TECHNIQUES OF REDUCTION

OF IUE DATA:

TIME HISTORY OF IUESIPS CONFIGURATIONS

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ABSTRACT

This document presents basic information needed by International Ultraviolet Explorer (IUE) Guest Observers and Archive Users to understand the evolution of the IUE Spectral Image Processing System (IUESIPS) and its products from April 1978 through December 1983. Data on the status of IUESIPS as a function of time are presented in a format intended to facilitate rapid indexing of the changes which have been made to correct deficiencies or errors and to enhance the capabilities of the system. It is expected that the collected information will be of particular utility to users of the IUE Regional Data Analysis Facilities and others wishing to assess the homogeneity of IUE data reduced at various times at either the U.S. or European IUE ground stations. The data contained herein represent an update and extension of the original information published in NASA IUE Newsletter No. 16, February 1982.

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SECTION 1 - INTRODUCTION

1.1 BACKGROUND

The International Ultraviolet Explorer (IUE) satellite has been in operation as a Guest Observer facility since 3 April 1978. The software system used by the IUE Observatory ground stations at GSFC and Villafranca del Castillo, Spain (VILSPA) to perform the standard IUE data reduction operations and generate the standard output products, the IUE Spectral Image Processing System (IUESIPS), has undergone a continual evolution since April 1978 in order to enhance the quality of the data processing and remove various software deficiencies and errors as they were discovered. As a result of the various changes made to IUESIPS, there is necessarily an inhomogeneity between data as it would be processed currently and the same data as it might have been processed at prior times. Documentation such as the International Ultraviolet Explorer Image Processing Information Manual, Version 1.1, CSC/TM-81/6268 (Version 2.0 is currently in preparation), and "Chronology of Modification to IUESIPS Output Products," in NASA IUE Newsletter No. 21, May 1983 provides summary data relating to the existence of the changes made to IUESIPS but does not contain sufficient detail to allow a quantitative assessment of each change, in most cases. The original version of "Time History of IUESIPS Configurations", covering the time period from April 1978 through March 1981, appeared as NASA IUE Newsletter No. 16, February 1982.

1.2 OBJECTIVES

The purpose of this document is to provide a means by which the evolution of IUESIPS since 3 April 1978 can be described in sufficient detail to allow full traceability of the system so that the degree of homogeneity of IUE data reduced at diverse times at either ground station (GSFC or VILSPA) may be adequately assessed. The goal is to provide documentation of each stage in

the life of IUESIPS in a form which is convenient and also comprehensive enough to allow the specification of the exact manner in which data reduced at the various stages differs from data reduced with the current system. Wherever possible, we have striven to facilitate the task of the user who wishes to devise correction procedures to remove reduction inhomogeneities. A collection of specific algorithms/procedures to perform meaningful transformation of early (pre-March 1981) data was presented in NASA IUE Newsletter No. 17, February 1982.

1.3 SCOPE

This document describes all known changes relating to the contents or format of the tape output products (GO and archive tapes) from standard IUESIPS processing through December 1983. Changes which pertain only to the other output products included in GO data packages (CalComp plots, Photowrite hardcopy images, and/or computer printouts) are not treated.

The emphasis in cataloging the changes to IUESIPS herein is on providing an accurate record of the time-history of the evolution of processing conditions, and wherever possible the exact times of implementation of the various changes, at GSFC and VILSPA separately, are given. The types of IUE images affected by each condition catalogued are indicated by camera and dispersion and processing option. Estimates of the actual number of images affected by each condition are made whenever possible. Cross references to available GSFC and VILSPA IUE Observatory software configuration documentation are made when pertinent, and a detailed description of each condition under discussion and its consequences in terms of the character of the data reduced under it, is provided. Finally, as many alternative means of identifying data processed under each configuration (in addition to the date and time of processing included in the headers of all but the very earliest images) as could be determined were included.

The period of time covered by the present document extends from 3 April 1978 to 31 December 1983 for GSFC data. VILSPA entries are less complete.

SECTION 2 - IUESIPS CONFIGURATIONS

2.1 GENERAL DESCRIPTION OF THE DOCUMENTATION

2.1.1 Sources of Data

Changes to the production version of IUESIPS have, with few exceptions, been effected through a configuration control process which provides documentation sufficient to identify the nature and time of implementation of each modification. At GSFC, such documentation comprises Science Operations Center Anomaly Reports (SOCARS), Scheme Modification Reports (SMRs), and Production Processing Modification Reports (PPMRs). SOCARS were used to justify and document the changes that are made to the IUESIPS software per se, i.e., applications programs, utilities, and IUESIPS systems software. SMRs were used to justify and document changes made to the production schemes of IUESIPS--those collections of standardized calls to the various IUESIPS applications programs needed to reduce images and generate specific output products for each image type. As of January 26, 1982, SOCARS and SMRs were combined into a single multi-purpose form, the PPMR. At VILSPA, similar documentation items (Image Processing Software Modification Reports and Scheme Modification Reports) are used to control changes. Although all these forms carry information describing the scope of the changes they document, the detail included is generally insufficient to describe fully the ramifications of each change from a Guest Observer's point of view. Indeed, for this very reason, and also because many of the configuration-control forms describe system-oriented changes which are transparent to the end recipient of the data, this document is being prepared with the user's interest in mind.

The GSFC and VILSPA documentation together were used to generate the short-form IUESIPS chronology appearing in NASA IUE Newsletter No. 21. These combined resources as well as any available more informal notes and records were used to generate the data compiled herein.

In many cases, supplementary and quite detailed explanatory information is contained in articles published in the IUE Newsletter. Notable here are articles in the continuing series "IUE Data reduction" of which 33 have so far been published in the NASA IUE Newsletter. Data from these articles and, more generally, from any relevant contribution in the Newsletter or elsewhere have been assimilated for the present document.

2.1.2 Contents and Use of This Document

As mentioned in Section 1.3 only those IUESIPS changes affecting the contents or format of the tape output products are cataloged in this document. The data are presented here as descriptions of each unique configuration of IUESIPS as defined by start and end dates representing the times at which relevant changes to the system were implemented. Such dates are recorded separately for the IUESIPS production systems at GSFC and at VILSPA. This approach is necessary since the effective times at which modifications were implemented at each ground station are in general different. Although functional equivalence of the two IUESIPS systems has been the overall operational goal, certain modifications at one station are not appropriate to the other; notable in this regard, for example, are most of the changes at GSFC dealing with calibration images, which are not acquired and analyzed as extensively at VILSPA.

The configurations are described herein in two ways: 1) an index of configurations by number and title, and 2) a detailed description of each configuration by number, title, effective dates, etc. The first task of a user wishing to relate data reduced in the past to present-day data is to identify all past configurations

appropriate to the old data, since the existence of a configuration with an end date at some point in the past indicates a difference between the system as it was prior to the end date and as it is now. From the index of configurations in Section 2.2, the user can ascertain, by title, which configurations are relevant to his data. The user can then refer to Section 2.3 for the detailed writeup of each configuration, including the exact start and end dates (when known), data types affected, relevant documentation, means of recognizing affected data (other than processing date), and the ramifications of each configuration.

2.2 INDEX OF CATALOGUED CONFIGURATIONS

In this section each past configuration is listed by sequential number and title (Table 2-1). Note that the configuration number is not necessarily an integer. Because a preliminary version of this document had been circulated at the IUE ground stations in May 1981 and some cross-referencing of configurations by number had occurred, it was decided to retain the original configuration numbers as they appeared in the preliminary version. This means that several additional configurations subsequently identified as falling by date between original configurations are assigned decimal numbers, such as 14.1, and inserted in the proper sequence. With this system of numbering, the configurations are generally in chronological order by the GSFC end date. Note that VILSPA does not necessarily implement changes in the same order as GSFC, and therefore the configurations are not always in chronological order according to VILSPA end dates.

Table 2-1. INDEX TO CATALOGED CONFIGURATIONS

Number	Title
1.	Corrupted data at the ends of smoothed background spectra (and hence net spectra).
2.	Restricted low dispersion SWP wavelength coverage (λ1000-1900Å).
3.	Erroneous negative fluxes in extracted spectra due to incorrect integer scaling of Fmax.
4.	Non-optimal center and radius values for circle in which geometric correction is performed.
5.	Suppression of redundant wavelengths in high dispersion processing.
6.	Unrestricted RIPPLE correction at ends of orders in high dispersion.
7.	Reversed naming convention for dispersion constants as written in IUESIPS history label.
8.	No processing dates written in IUESIPS history labels.
9.	One-pixel error in OSCRIBE (dispersion-constant overlay program).
10.	Nearest-neighbor line-finding algorithm in WAVECAL.
11.	Use of ITF's composed of single exposures.
12.	Accomplish registration of spectral orders with dispersion-constant overlays by shifting the images (rather than the dispersion constants).
13.	Extraction of low dispersion spectra using the programs SPIN, ROTATEH, and COMPARE.
14.	Epsilon-field values in smoothed backgrounds shifted to incorrect wavelengths.
14.1	Dispersion constant and reseau calibration used for VILSPA reductions (1).
14.2	Error in long wavelength high dispersion wavelengths.
15.	Reseau flagging in low dispersion merged spectra does not distinguish between reseau mark in gross spectrum and reseau mark in background spectrum.
16.	Geometric correction of high dispersion images accomplished using reseaux measured on high dispersion WAVECAL images.

Table 2-1 continued

Number	Title
17.	Use of non-optimal RIPPLE parameters for LWR.
18.	Extract low dispersion spectra (EXTLOW) with HT=9 and DISTANCE=8.0 (Will not properly extract spectra of aperture-filling objects).
19.	Image sequence number sometimes zeroed out in scale factor record of merged spectral file.
20.	Determine LWR low dispersion wavelength calibrations from preliminary version of line library.
21.	Use of incorrect offsets from small to large aperture in LWR.
21.1	Error in SWP low dispersion wavelength scale.
22.	Perform all registrations of spectral orders with dispersion-constant overlays manually.
23.	Camera number transmitted as true number plus 10 or 20 in scale factor record of merged spectral file.
24.	Determine SWP low dispersion wavelength calibrations from preliminary version of line library.
25.	Extract low dispersion large-aperture point-source spectra with DISTANCE=8.0.
26.	Improper truncation of area of image photometrically corrected.
27.	Automatic registration of spectral orders done using only 6 sampling areas in DSPCON.
28.	Omit vacuum-to-air correction for LWR low-dispersion single-aperture reduction.
29.	Photometrically correct entire 768 x 768 image (SWP high dispersion).
30.	Photometrically correct entire 768 x 768 image (low dispersion).
31.	No information on values of OMEGA, HBACK, or DISTANCE in IUESIPS history labels.
32.	No information on values of automatic registration shifts recorded in IUESIPS history labels.

Table 2-1 continued

Number	Title
33.	Process order 65 in SWP high dispersion.
34.	Photometrically correct entire 768 x 768 image (LWR high dispersion).
34.1	Dispersion constant and reseau calibration used for VILSPA reduction (2).
34.2	Dispersion constant and reseau calibration used for VILSPA reduction (3).
35.	Use incorrect version of ETOEM.
36.	High dispersion partial processing on S/360 (VICAR).
37.	Use original IUESIPS File Management System.
38.	No information on values of manual registration shifts recorded in IUESIPS history label.
39.	No output products generated for images designated "Do Not Process".
40.	Improperly convert certain spectral files with negative fluxes to GO-tape integer format.
41.	All high dispersion extractions due with HT=5.
42.	Write redundant raw-image tape files for wavelength calibration images.
43.	No short header file written at beginning of GO tape.
44.	Use of SWP ITF with incorrect 20% exposure level.
45.	Use of non-optimal pixel offsets from small to large aperture.
46.	Use of pixel offsets from small to large aperture which do not correspond to physical center of large aperture.
47.	Write geometrically-correct-image tape file for wavelength calibration images.
48.	Use biweekly dispersion-constant calibrations in low dispersion.
49.	Determine high dispersion wavelength calibrations from unrefined line libraries (version I libraries).
50.	Do not provide absolutely calibrated net spectrum in low dispersion.

Table 2-1 continued

Number	Title
51.	Truncation of ITF at upper limit.
52.	Incorrect units for DISTANCE parameter in EXTLOW.
53.	Use original Astron. Astrophys. absolute calibration.
54.	Determine high dispersion wavelength calibrations from partially refined line libraries (version II libraries).
55.	Use biweekly reseau calibrations.
56.	Use biweekly dispersion constant calibrations in high dispersion.
57.	Use preliminary mean dispersion constants for low dispersion.
58.	Inaccurate automatic registration programs.
59.	Determine high dispersion wavelength calibrations from further refinements to line libraries (version III libraries).
59.1	Incorrectly transmit 5-digit image sequence numbers to scale-factor record of extracted spectral files.
60.	Processing of low dispersion spectra using the programs GEOM, FICOR, and EXTLOW.
61.	Non-perpendicular manual shifts (REGISTER).
62.	Label lacks scheme name and auto/manual message.
63.	Incorrect manual shift for SWP images (REG).
64.	VBBLK without label processing.
65.	Incorrect entries in label by SPECLO (negative declination and zero shift).
66.	Inaccurate automatic registration (LWR-LOW, SWP-HIGH and all Trailed).
67.	Calibration files without temperature corrections (low dispersion).

Number	Title
68.	Use of preliminary parameters to specify the region to be processed by the program PHOTOM.
69.	Use positional information to determine the bounds of the area of the to be extracted (SPECLO).
70.	Unused lines of header label not blank-filled by POSTLO.
71.	Dispersion constant and reseau calibration used for VILSPA reductions (4).
72.	Use June 1979 - June 1980 mean dispersion constants in high dispersion.
73.	Calibration files without temperature corrections (high dispersion).
74.	Use only two pass running average for background smoothing in high dispersion.
75.	Error in specifying the region to which the photometric correction is applied.
76.	Potential loss of lines in raw image.
77.	Non-optimal automatic registration of closely-spaced orders in high dispersion spectra.
78.	Use preliminary ITF for LWP.
79.	Preliminary ITF extrapolation method used in photometric correction.
80.	No flagging of LWR microphonic pings.
81.	Microphonics flagging in the header label of the raw image file.
82.	Processing of high dispersion spectra using the programs GEOM, FICOR and DATEXTH (or DATEXTH2).
83.	Round-off error in dispersion constants listed in record 0 of extracted spectral files.
84.	Camera and image sequence number of raw image (used for locating reseaux) not contained in first line of reseau-position data set.
85.	Possible slight automatic registration errors.

(continued)

Number	Title
86.	Redundant "L" in column 72 of label of certain processed data files sent to NSSDC.
87.	Incompletely extract data from last spectral order of high dispersion spectra.
88.	Error in the observation date calculation used in the high dispersion heliocentric velocity correction (and written to the header label for both dispersion modes).
89.	Error in handling negative declination values in high dispersion processing.
90.	Error in scaling net ripple-corrected fluxes in high dispersion.
91.	Perform photometric correction in low dispersion (under new software) without spatial truncation due to partial-read boundaries.
92.	Perform photometric correction in low dispersion (under new software) in a non-optimally centered swath.
93.	Utilize old echelle ripple correction in high dispersion.
94.	Use of non-optimal pixel offsets from small to large aperture in LWP.
95.	Use of March 1979 - January 1981 mean dispersion constants for LWR and SWP.
96.	Use of LWP dispersion constant files derived from single calibration images obtained on GMT day 168, 1981.
97.	No optimal filtering for noise conditioning in LWP high dispersion processing.
98.	No flagging of "bright spots".
99.	Microphonics detection software run in "dummy" mode for SWP and LWP cameras.
100.	Possible error in extracting correct head amplifier temperature from image header label.
101.	Non-perpendicular manual registration shift.
102.	Use of June 1980 - August 1982 mean LWP dispersion constants without a correction for temperature.

(continued)

Number	Title
103.	Possible corruption of binary temperature data contained in image header label.
104.	Automatic registration without avoidance of multiple regions containing microphonic noise.
105.	Automatic registration without avoidance of any region containing microphonic noise.
106.	Low dispersion background smoothing filter width of 30 data points.
107.	Error in handling extracted LWR spectral data from images flagged as containing more than one region of microphonic noise.
108.	Incorrect observation date calculation when the GMT day number changes between the end of exposure and the time of read.
109.	No absolute calibration of LWP low dispersion fluxes.
110.	No method for identifying modified image header label parameters.
111.	Inaccurate message "MEAN DC USED" in label of temperature corrected LWP images.

2.3 DETAILED CONFIGURATION DATA

In this section the fully-detailed discussion of each cataloged IUESIPS configuration is found. To facilitate the use of this section as a reference tool, a standard format for the data presentation has been adopted. Each configuration begins on a new page and has the title and sequence number at the top of the page. The entries under "Data Affected" are used to specify the types of data pertinent to the configuration described. The "Camera" and "Dispersion" entries are self-evident. "Processing" means the specific type of file affected by the configuration - for example, a change in the photometric correction affects both the photometrically corrected image itself and the spectra extracted from it, whereas a change in wavelength scales affects only the extracted spectra. The file mnemonic conventions defined in CSC/TM-81/6268, in "IUE Data Reduction XVIII, Implementation of New Low Dispersion Software: Summary of Output Format Changes" in NASA IUE Newsletter No. 12, and in "IUE Data Reduction XXIV, Implementation of New High Dispersion Software: Summary of Output Format Changes" in NASA IUE Newsletter No. 18 are used often here (GPI, ESSR, ESHI, etc.). The terminology "merged spectra" refers to the file of merged gross, background and various net spectra (ESHI, ESLO, MEHI, or MELO), whereas in low dispersion the terminology "extracted spectra" would include both the line-by-line (ESSR or LBLS) and merged spectra.

The start and end dates (GMT) for each configuration are given, separately for GSFC and VILSPA, with the greatest precision possible. (An entry of N/A means that the configuration is not applicable at that particular ground station). Where an exact time of day is available, it is given in GMT hours and minutes (hh:mm). In certain cases where exact times of changes were not recorded originally, a limit on the time of the change is set by the existence of a program or scheme listing evidencing the change (and which bears a time of day). In such cases the time of the listing becomes an "upper limit" to the time of the change and is preceded by the symbol "<".

When the start or end date is left totally blank, no information is currently available on the change date (certain VILSPA dates only). VILSPA dates which are uncertain but supported by strong indirect evidence are enclosed within exclamation marks, e.g., !14 June 1978!

The entry "Media" reflects the output product media affected by the configuration. The entry "Estimated Fraction of Processed Images Affected" is an estimated proportion of images actually affected by the configuration out of the images potentially affected (i.e., the estimated fraction of affected data out of total data of the type specified above). The "Estimated Number of Images Affected" is an estimate of all affected data (GSFC and VILSPA). Both of the above estimates are rough and should not be relied upon for detailed statistics.

Under "Pertinent Documentation" are included cross references to all relevant documentation, including GSFC SOCAR, SMR, and PPMR numbers, IUE Newsletter articles, and other sources.

The "Description" section contains the discussion of the nature of each configuration, with equations, tables, and figures included where applicable. The attempt was made to provide sufficient detail without excessive length. Those descriptions or parts thereof provided by Dr. K.J.E. Northover of VILSPA are enclosed within brackets "< >".

Under "Means of Identifying Affected Data" we have provided, where possible, means of recognizing data affected by each configuration which are either alternative to or complement the date of processing. Where it was not possible to specify any such alternative identification methods, this section was omitted.

The set of detailed descriptions follows, according to the format outlined above.

NO. 1

TITLE: Corrupted data at the ends of smoothed background spectra (and hence net spectra).

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp

DATES: BEGIN 3 April 1978 END {14 April 1978 / 20 April 1978} (GSFC)

BEGIN 17 April 1978 END !14 June 1978! (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 50

PERTINENT DOCUMENTATION: GSFC SOCAR 91, SOCAR 95

DESCRIPTION: Flux points at ends of orders which had been processed with SMOOTH (the running-average smoothing done on background spectra) were either incorrectly calculated or dropped because of an indexing problem in the code. The result was corrupted data at the ends of orders (smoothed background and net files) in high and low dispersion. The number of points that were handled incorrectly was TBD.

The program SMOOTH was modified to correct the problem; existing documentation indicates changes were made on 14 April 1978 and 20 April 1978 but is insufficient to fully specify the time and nature of the fixes.

NO. 2

TITLE: Restricted low dispersion SWP wavelength coverage (λ1000-1900Å)

DATA AFFECTED:

CAMERA: SWP DISPERSION: Low PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp

DATES: BEGIN 3 April 1978 END <19:47 20 April 1978(GSFC)

BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 20

PERTINENT DOCUMENTATION: GSFC SMR 4

DESCRIPTION: The SWP low dispersion extraction scheme cut off at λ=1900Å. By modifying the size field in call to COMPARE so as to read (1, 81, 32, 1200) instead of (1, 183, 32, 1200) and by extending the call to SMOOTH with NAVG=1 to an LMAX of 2000.0 instead of 1900.0, spectral extraction was extended to λ=2000Å. Plots were similarly modified to show the extended spectral region.

MEANS OF IDENTIFYING AFFECTED DATA:

- Absence of extracted data at wavelengths longer than 1900 Å in SWP low dispersion.

NO. 3 ✓

TITLE: Erroneous negative fluxes in extracted spectra due to incorrect integer scaling of Fmax.

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted Spectra

MEDIA: Tape

DATES: BEGIN 3 April 1978 END 26 April 1978 (GSFC)

BEGIN 17 April 1978 END !14 June 1978! (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 20%

ESTIMATED NUMBER OF IMAGES AFFECTED: 20

PERTINENT DOCUMENTATION: GSFC SOCAR 78, SOCAR 86, SOCAR 98, SOCAR 107, SOCAR 125

DESCRIPTION: The program ITOE which performs the scaling of floating-point internal-format fluxes scaled the fluxes so that the integer Fmax value was 32767 (± roundoff). When positive roundoff occurred, the 16-bit format overflowed, causing Fmax to be interpreted as a large negative number. Thus, any point extracted with flux equal to Fmax would be incorrectly encoded as negative numbers on the tape. In general, only a small number of points would be involved. Furthermore, the sudden jump to large negative numbers is easily identified.

A safety margin for roundoff error was therefore built in so that instead of scaling Fmax to 32767, Fmax + 1 is scaled to 32760.

MEANS OF IDENTIFYING AFFECTED DATA:

- Presence of sudden jumps to large negative fluxes amidst positive fluxes near 32767.

NO. 4

TITLE: Non-optimal center and radius values for circle in which geometric correction is performed.

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: GPI, extracted spectra

MEDIA: Tape, Calcomp, Photowrite

DATES: BEGIN 3 April 1978 END 27 April 1978 (GSFC)

BEGIN 17 April 1978 END !14 June 1978! (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 100

PERTINENT DOCUMENTATION: GSFC SOCAR 109

DESCRIPTION: The program GEOMF, which geometrically corrects a raw image, only operates within a circle (in raw-image space) of radius RAD and centered at sample = CENS and line = CENL. Pixels in the output image which correspond to positions in the input image outside of this circle are set to zero DN. This is done both to save execution time and to remove as much of the unwanted target ring as possible.

Prior to end date, the values for these parameters had been:

CENS = 384.0
CENL = 384.0
RAD = 370.0

After this date, the new values are:

CENS = 390.0
CENL = 390.0
RAD = 358.0

That is, the circular area over which the geometric correction (and hence all further meaningful photometric correction and extraction) is performed is moved "down to the right" and made slightly smaller. The primary effect of this change is to remove a larger portion of the target ring from the corrected image and hence provide a cleaner extraction of data.

MEANS OF IDENTIFYING AFFECTED DATA:

- Examination of geometrically and photometrically corrected image (GPI).

NO. 5

TITLE: Suppression of redundant wavelengths in high dispersion processing

DATA AFFECTED:

CAMERA: All DISPERSION: High PROCESSING: Extracted spectra

MEDIA: Tape, Calcomp

DATES: BEGIN 3 April 1978 END <21:44 08 May 1978 (GSFC)

BEGIN 17 April 1978 END 14 June 1978 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 100

PERTINENT DOCUMENTATION: GSFC SOCAR 99, SMR 8

DESCRIPTION: The program CUTMERGE, which restricted the extracted wavelengths for each order to the range $\frac{2K}{2M+1} < \lambda < \frac{2K^*}{2M-1}$, was used in order to produce properly merged gross, interorder, net, and net-ripple-corrected spectra on tape. Because of a bug in the program COMBINE (used to subtract interorder spectrum from gross to obtain net) which dropped data points from the end of the net spectrum, CUTMERGE had been used to cut all four spectra to equal length for merging in GO-tape format. When COMBINE was fixed to alleviate that problem (SOCAR 99), CUTMERGE was dropped as of the end dates shown.

As a result, there is no overlap of redundant wavelengths between most orders, so that coincidence of features can be used to better judge their reality in many cases.

* $K = \begin{matrix} 231,342 \text{ for LWR} \\ 137,600 \text{ for SWP} \end{matrix}$ (Note: not the same as K values for RIPPLE).

MEANS OF IDENTIFYING AFFECTED DATA:

- Complete lack of wavelength redundancy in data on GO tape.
- Program step CUTMERGE appears in I. P. history portion of label.

NO. 6

TITLE: Unrestricted RIPPLE correction at ends of orders in high dispersion

DATA AFFECTED:

CAMERA: All DISPERSION: High PROCESSING: Extracted spectrum

MEDIA: Tape, Calcomp

DATES: BEGIN 3 April 1978 END 13:24 11 May 1978 (GSFC)

BEGIN 17 April 1978 END !14 June 1978! (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 100

PERTINENT DOCUMENTATION: GSFC SOCAR 119

DESCRIPTION: The program RIPPLE calculates a flux Fcorr(λ) corrected for the echelle blaze ("ripple") function with the formula:

$$\text{Fcorr}\ (\lambda) = \frac{F(\lambda)}{R(\lambda)}$$

where $F(\lambda)$ is the uncorrected net flux

$$R(\lambda) \equiv \frac{\sin^2 X}{X^2}\ (1 + aX^2)$$

$$X = \frac{\pi m^2\ (\lambda - \lambda_c)}{K}$$

$$\lambda_c = \frac{K}{m}$$

m = order number

and $K = 137,725$, $a = 0.10$ } SWP

and $K = 231,300$, $a = 0.08$ } LWR at GSFC prior to 7 July 1978 (see also the change as of that date)

With this formula, the correction factor at the ends of the orders (large X) are large, resulting in the amplification of noise.

On the end date above, a limit of 2.61 was placed on the value of X, resulting in a maximum multiplicative flux correction factor $\frac{1}{R(\lambda)}$ of 15.77 in SWP and 17.16 (prior to 7 July 1978) for LWR.

NO. 7

TITLE: Reversed naming convention for dispersion constants as printed in IUESIPS history label.

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted spectra

MEDIA: Tape, CalComp

DATES: BEGIN 3 April 1978 END 11 May 1978 (GSFC)

BEGIN 17 April 1978 END !14 June 1978! (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 250

PERTINENT DOCUMENTATION: GSFC SOCAR 113

DESCRIPTION: The naming convention for the A_i and B_i values of dispersion constants was reversed in the labels written by the programs DATEXTH2 and COMPARE. Both programs named the A_i as the line-coordinate constants, and the B_i as the sample-coordinate constants.

As of the end date above, the A_i refer to the sample coordinate constants and the B_i to the line-coordinate constants.

NO. 8 X

TITLE: No processing dates written in IUESIPS history labels.

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: All files

MEDIA: Tape, Calcomp, Photowrite

DATES: BEGIN 3 April 1978 END 04:40 18 May 1978 (GSFC)

BEGIN 17 April 1978 END 14 June 1978 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 350

PERTINENT DOCUMENTATION: GSFC SOCAR 112

DESCRIPTION: The date and time of processing was not included in the IUESIPS history labels until the end date above. This is a serious deficiency, since the processing date provides the basic traceability parameter for the processing.

As of the end date, the IUESIPS Control Executive was modified to write the GMT time and date of processing, in the sample format 04:40Z May 18, 1978, in the history portion of the IUESIPS label (lines 101 on) for each applications program executed.

MEANS OF IDENTIFYING AFFECTED DATA:

- Lack of dates in IUESIPS history portion of label.

NO. 9 X

TITLE: One-pixel error in OSCRIBE2 (dispersion-constant overlay program).

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted spectra

MEDIA: Tape, Calcomp, Photowrite

DATES: BEGIN 3 April 1978 END <17:08 18 May 1978 (GSFC)

BEGIN 17 April 1978 END 14 June 1978 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 350

PERTINENT DOCUMENTATION: GSFC SOCAR 120, SMR 11

DESCRIPTION: The program OSCRIBE2 generated the overlays of the trajectories followed by the dispersion relations. It was found that a 1-pixel error (in the sample direction) was being introduced in generating the overlays, such that the generated overlays were situated at too large a sample number (i.e., too far "to the right") by 1 pixel. The effect of this would be change the positioning of the extraction slit with respect to the spectral orders, in as much as the (incorrect) overlays were registered with the orders by shifting the image prior to the spectral extraction step. For example, if no shift were in fact necessary, the error in OSCRIBE2 would have caused an offset to appear which would result in a shift leading to a spectral order which was not centered in the extraction slit. The effects of this on extracted flux would be small in low dispersion where the slit is relatively long, but could be measurable in high dispersion where the shorter slit and closer interorder spacing could result in both a reduced gross flux and an increased background flux. The effects on assigned wavelengths are small ($\leq$.7 pixel along dispersion) but variable, depending on the direction in which the compensating image shift was applied by the processing operator.

The program OSCRIBE replaced OSCRIBE2 and corrected the problem.

continued - No. 9

MEANS OF IDENTIFYING AFFECTED DATA:

- Program name OSCRIBE2 (instead of OSCRIBE) written in label of photowrite image with dispersion - constant overlay.

NO. 10 X

TITLE: Nearest-neighbor line-finding algorithm in WAVECAL.

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp, Photowrite

DATES:	BEGIN 3 April 1978	END	18 May 1978 (LWR high) 19 May 1978 (SWP low) 21 May 1978 (LWR low & SWP high)	(GSFC)
	BEGIN 17 April 1978	END	14 June 1978	(VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 400

PERTINENT DOCUMENTATION: GSFC SMR 10

DESCRIPTION:

The program WAVECAL (which finds the coordinates of individual platinum lines in the geometrically-corrected calibration images) used a nearest-neighbor result from the cross-correlation search algorithm.

A modified version of the program (WAVECAL2) was installed (at GSFC on 15 May 1978) to interpolate smoothly the inferred coordinates of maximum correlation (i.e., the platinum-line positions) which are in general not integer pixel values. The resulting dispersion constants are hence slightly more accurate. Note that the effective end dates for this condition depend on when the next calibration image for each camera and dispersion mode was processed.

NO. 11 ✓✓

TITLE: Use of ITF's composed of single exposures

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: GPI, extracted spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 3 April 1978 END 20:30 22 May 1978 (GSFC)

BEGIN 17 April 1978 END 14 June 1978 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 500

PERTINENT DOCUMENTATION: GSFC SMR 12, CSC/TM-79/6301

DESCRIPTION:

Prior to the end dates shown, the Intensity Transfer Functions (ITFs) used were comprised of single flat-field images at each exposure level. The ITFs installed as of the end dates are comprised of averages of at least 2 (usually 3 or 4) images at each exposure level. In addition, the new LWR ITF was extended to a higher exposure level (nominal 200% exposure). The new SWP ITF was reduced to 11 levels instead of 12, but still covers approximately the same exposure range (up to nominal 160% level). CAUTION: The new SWP ITF installed on end date also contained the famous error in the 20% exposure level (see NASA IUE Newsletter No. 7, Nov. 1979 see also change of 07 July 1979)

Summary of characteristics of the changes made on ending dates

ITF CHARACTERISTIC	LWR		SWP	
	OLD	NEW	OLD	NEW*
Number of exposure levels	12	12	12	11
Nominal highest exposure level	140%	200%	160%	160%
Maximum unsaturated flux number †	18000	25219	18003	17740

† See 8 Jan. 1980 change to extrapolate the ITFs.
* New SWP ITF had large photometric errors for 1084<FN<4291. (See NASA IUE Newsletter No. 7.)

MEANS OF IDENTIFYING AFFECTED DATA:

- The tables of T values printed in the IUESIPS history labels of photometrically corrected images (see IUE Image Processing Information Manual, Version 1.0, CSC/TM-79/6301) These values are the effective exposure times, in units of 0.01 seconds, assigned to the various levels of the ITF. These values are:

Old ITFs

SWP:	0	1800	3600	5500	7300	9100
	10900	12700	14500	18200	21800	29100
LWR:	0	1800	3700	5600	7500	9400
	11200	15000	18800	22500	26300	30000

NEW ITFs

SWP:	0	1753	3461	6936	9000	10575
	14299	17709	21546	25156	28674	
LWR:	0	2303	4069	8008	10073	11878
	15883	20149	24471	29391	34333	42032

NO. 12

TITLE: Accomplish registration of spectral orders with dispersion-constant overlays by shifting the images (rather than the dispersion constants)

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 3 April 1978 END 20:30 22 May 1978 (GSFC)

BEGIN 17 April 1978 END 14 June 1978 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 500

PERTINENT DOCUMENTATION: GSFC SMR 14

DESCRIPTION:

The registration of the spectral orders with the dispersion relations (which dictate the trajectory of the extraction slit) was accomplished by holding the dispersion constants fixed and actually moving the geometrically and photometrically corrected image by the small number of pixels required. The disadvantages of this procedure were that

1). only integer-pixel shifts were allowed (i.e., no resampling was done)

2). when the image is shifted, the reseau marks move with the image, and the reseau flagging algorithm which works on the expectation of fixed reseau positions will not work correctly.

On the end dates shown, a change was made so that the image is held fixed and the registration is done by shifting the zero-point terms in the dispersion relations. Since the zero-point shift need not be an integer-pixel value, disadvantage 1 is removed, and since the image and reseaux are fixed in position, disadvantage 2 is also removed. Note the following changes to the data are involved in this procedural change:

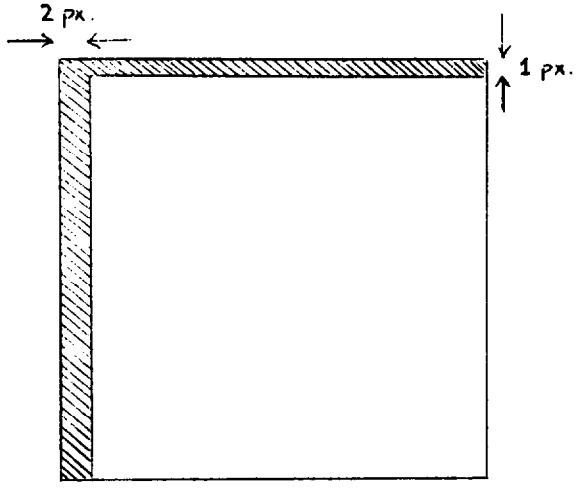
a). The geometrically and photometrically corrected image written on the tape is now unshifted (previously, the shifted image had been written to tape, with zeroes filled in the samples (or lines) that were

brought into the 768 x 768 pixel array during the shift step)

b). The dispersion constants written in the IUESIPS label are the shifted constants used to do the data extraction. They would be a slightly more accurate representation of the order location because of the fractional-pixel shifting allowed.

MEANS OF IDENTIFYING AFFECTED DATA:

- Geometrically and photometrically corrected images on tape (GPI) will have a border of zero-filled pixels representing the lines (or samples) shifted into the 768 x 768 array by the shifting process



e.g. an image shifted +2 pixels and +1 line would have zero values in the bytes corresponding to the pixels shown in shaded area above.

- IUESIPS history label of geometrically and photometrically corrected image shows that program SHIFT was executed.
- Reduced photowrite image with OSCRIBE overlay has information in label showing that the program SHIFT was executed, and it contains a line of text which reads **** OSCRIBED SHIFTED IMAGE ****

TITLE: Extraction of low dispersion spectra using the programs SPIN, ROTATEH, and COMPARE.

DATA AFFECTED:

CAMERA: All DISPERSION: Low PROCESSING: Extracted spectra

MEDIA: Tape, Calcomp, Photowrite

DATES: BEGIN 3 April 1978 END 20:30 22 May 1978(GSFC)

BEGIN 17 April 1978 END 14 Jun 1978(VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 300

PERTINENT DOCUMENTATION: GSFC SMR 15

DESCRIPTION: The use of the programs SPIN, ROTATEH, and COMPARE to extract low dispersion spectra was accompanied by several drawbacks and/or conditions which were eliminated by the introduction of the program EXTLOW for extracting low dispersion spectra. These conditions were:

1). No flagging of reseaux or saturated pixels. All quality-measure ϵ values set to 100.

2). Spectra extracted from a "rectified image segment", being a geometrically reshuffled portion of the geometrically and photometrically corrected image aligned parallel to the dispersion line.

3). The line-by-line or spatially-resolved spectra (NL=32, NS=1204) were extracted from the rectified image segment using a 1-pixel slit and were assigned "pseudo order" numbers 1-32. The 2000-FN-per-pixel offset added to the photometrically corrected image was included in the line-by-line flux values.

4). The merged slit-integrated spectra (NL=7, NS=1204) were extracted from the rectified image segment using a summation of line-by-line fluxes representing a slit 1 pixel wide and 10 pixels long. Gross spectrum from sum of lines 12-21, and background spectrum from sum of lines 7-11 and 22-26. The 2000-FN-per-pixel offset

was included in both the gross and background fluxes (total 20,000 FN in each because of 10-pixel total slit area). Apart from the offset, which cancels out in the net spectrum, the net slit-integrated FN values were smaller than those subsequently obtained using EXTLOW, due to the geometric projection effects inherent in the extraction method. The ratios of EXTLOW net FN to COMPARE net FN are 1.78 for LWR and 1.83 for SWP.

With the introduction of EXTLOW, the following changes occurred:

1). ε values computed similarly to high dispersion case

$$\varepsilon = 0.264 \times d + \varepsilon_r + \varepsilon_s$$

where d = distance from center of tube in pixels

$$\varepsilon_r = \begin{cases} -800 \text{ if any pixel within the slit defining flux (gross or background) is within 2 pixels of the fixed reseau marks.} \\ 0 \text{ otherwise} \end{cases}$$

$$\varepsilon_s = \begin{cases} -1600 \text{ if any pixel in slit is saturated (DN=255)} \\ 0 \text{ otherwise} \end{cases}$$

2). Spectra extracted directly from the geometrically and photometrically corrected image, in a manner similar to high dispersion.

3). The line-by-line spectra (NL=55, NS=1204) extracted with an effective slit area of $\sqrt{2} \times \sqrt{2}$ pixels, each sampling slit being oriented at an angle of 45° to the line and sample directions. Each of the spectra are assigned a pseudo-order number from 73-127, with order numbers increasing from the large aperture toward the small. All 2000-FN offsets removed.

4). The merged spectra (NL=7, NS=1204) extracted with a slit of effective width $\sqrt{2}$ pixels and area of 17 pixels (i.e., the slit is $9\sqrt{2}$ pixel-widths long). The background spectra are extracted from the sum of 5 pixels on either side of the gross extraction slit, centered at a nominal distance of $8\sqrt{2}$ pixels from the dispersion line (but see change to EXTLOW2 on 01 March 1980) and normalized to a total area of 17 pixels. All 2000-FN offsets removed. Net FN differ from COMPARE values by the projection factors cited above.

MEANS OF IDENTIFYING AFFECTED DATA:

- Line-by-line file only 32 lines
- All $\epsilon \equiv 100$
- Program names in IUESIPS history label

NO. 14 X

TITLE: Epsilon-field values in smoothed backgrounds shifted to incorrect wavelength.

DATA AFFECTED:

CAMERA: All DISPERSION: All PROCESSING: Extracted spectra

MEDIA: Tape, CalComp

DATES: BEGIN 3 April 1978 END <14:10 01 June 1978 (GSFC)

BEGIN 17 April 1978 END 17:00 01 Feb 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 700

PERTINENT DOCUMENTATION: GSFC SOCAR 126, SMR 8, SMR 25

DESCRIPTION: The quality-measure ε field in smoothed background spectra was displaced by + NAVG/2 points each time SMOOTH was executed. NAVG is the width of the running-average filter used (=15) so that ε values were displaced by +7 extraction points in each pass of SMOOTH. Since a double-pass smoothing is employed, the ε values were displaced by 14 points from their correct positions in smoothed background spectra; i.e., the wrong wavelengths were flagged for reseaux or saturation.

This misplacement is evident in the net spectrum defined as the gross minus the smoothed background, since the flags are combined. The ε values from the smoothed background appeared displaced from their correct positions, although those ε conditions arising from the gross spectrum were correct. Hence, the ε values in merged spectra prior to end date should be regarded with caution--only those reseaux or saturated-pixel flags arising from the gross spectrum would be correctly placed.

MEANS OF IDENTIFYING AFFECTED DATA:

- Points in net spectrum marked with distinguishing ε values (i.e., reseaux or saturation) whereas the same wavelengths do not have those values in either the gross or unsmoothed background. (This method is applicable only if the original CalComp plots are available, since the ε in merged spectral file on tape is a combined value).

NO. 14.1 *

TITLE: Dispersion constant and reseau calibrations used for VILSPA reductions (1).

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: All except RAW.

MEDIA: Tape, Calcomp, Photowrite

DATES: BEGIN N/A END N/A (GSFC)

BEGIN 17 April 1978 END 14 June 1978 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 250

PERTINENT DOCUMENTATION: VILSPA TN/2002 - 00/AS/780417 (Release Ø 9 File)

DESCRIPTION: <During this period the wavelength and geometry calibrations used for the reduction of all data at VILSPA were based on images acquired between 18 March 1978 and 24 March 1978.

It is believed that these calibrations were used throughout. Evidence exists that another calibration, for LWR, dated 05 May 1978 and using images 27 April 1978 to 09 May 1978 was available by May 18, 1978. No specific evidence of its use is known.>

NO. 14.2 X

TITLE: Error in long wavelength high dispersion wavelengths.

DATA AFFECTED:

CAMERA: LWR DISPERSION: High PROCESSING: Extracted spectra

MEDIA: Tape, CalComp

DATES: BEGIN N/A END N/A (GSFC)

BEGIN 17 April 1978 END 15 June 1978 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 30

PERTINENT DOCUMENTATION: VILSPA memos: MP/cr - 065 (17 May 1978) and MP/al - 065 (23 June 1978)

DESCRIPTION: < Derived wavelengths were approximately 0.7 Å too short. Error arose because scheme and calibration structure was such that the vacuum to air wavelength conversion was effectively performed twice.>

NO. 15 X

TITLE: Reseau flagging in low dispersion merged spectra does not distinguish between reseau mark in gross spectrum and reseau mark in background spectrum.

DATA AFFECTED:

CAMERA: All DISPERSION: Low PROCESSING: Merged Spectra

MEDIA: Tape, CalComp

DATES: BEGIN 20:30 22 May 1978 END 16 Jun 1978 (GSFC)

BEGIN 17 April 1978 END !17:00 01 Feb 1979! (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 500

PERTINENT DOCUMENTATION: GSFC SOCAR 127, SOCAR 134

DESCRIPTION: The version of EXTLOW in use between the dates above used identical flagging for reseau presence in both gross and background spectra, viz.,-800. When these spectra were combined to form the merged file, it was not possible from the merged data alone to tell which spectrum the reseau affected. Since the background spectrum is smoothed, reseaux there are generally of less significance than reseaux in the gross spectrum and it is therefore desireable to identify the point of origin of the reseau flag in the merged file.

The fix made was to flag reseaux in the background spectrum with the value -400 so that a differentiation could be made in the merged spectra as to the origin of the reseau contamination.

Thus $\varepsilon = 0.264 \times d + \varepsilon_r + \varepsilon_s$

where d = distance from center of tube in pixels

$$\varepsilon_r = \begin{cases} -800 \text{ if any pixel within the gross extraction slit is within 2 pixels of reseau} \\ -400 \text{ if any pixel within the background extraction slit is within 2 pixels of reseau (low disp. only)} \\ 0 \text{ otherwise} \end{cases}$$

$$\varepsilon_s = \begin{cases} -1600 & \text{if any pixel in slit is saturated (DN=255)} \\ 0 & \text{otherwise} \end{cases}$$

MEANS OF IDENTIFYING AFFECTED DATA:

- No ε values in the range $-400 < \varepsilon < -300$

NO. 16 X

TITLE: Geometric correction of high dispersion images accomplished using reseaux measured on high dispersion WAVECAL images.

DATA AFFECTED:

CAMERA: All DISPERSION: High PROCESSING: GPI, Extracted spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 3 April 1978 END { 11:00 9 Jun. 1978 (SWP) / 23:00 1 Jul. 1978 (LWR) } (GSFC)

BEGIN 17 April 1978 END !17:00 01 Feb 1979! (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 500

PERTINENT DOCUMENTATION:

DESCRIPTION: Prior to the end dates shown above, the reseau positions used to generate the geometric correction parameters for reducing high dispersion images were measured directly from high dispersion WAVECAL images. The difficulty is that the presence of many platinum emission lines on such images has the potential for contaminating the cross-correlation search for reseau positions. Such contamination was a considerably more significant problem in SWP than in LWR, and in particular in a region near the lower left of the SWP tube where a number of neighboring reseaux lie near platinum lines.

< At VILSPA a single set of geometric parameters has always been used for both high and low dispersion. It is strongly suspected, but not proven, that in this period these were derived from the high dispersion WAVECAL images appropriate to each installed calibration.>

The problem at its worst manifests itself by a poor geometric correction giving rise to distortions in the corrected image. It is believed that all instances of such serious contaminations (i.e., distortion readily apparent to the eye) were corrected by reprocessing, and that instances of less serious contamination were filtered out by the reseau-smoothing algorithm which generated the geometric parameters. (The smoothing algorithm failed when too many reseaux in a given row or column were contaminated).

The permanent solution to this problem was the procedural change of using only low dispersion calibration frames (on which contamination of smoothed reseaux is insignificant) to generate the geometric correction parameters for all images.

MEANS OF IDENTIFYING AFFECTED DATA:

- Distortions in geometrically and photometrically corrected image (GPI file).

NO. 17 X

TITLE: Use of non-optimal RIPPLE parameters for LWR:

K = 231,300 A = 0.08 (GSFC)

K = 231,075 A = 0.09 (VILSPA) *

DATA AFFECTED:

CAMERA: LWR DISPERSION: High PROCESSING: Extracted spectra

MEDIA: Tape, CalComp

DATES: BEGIN 3 April 1978 END <06:07 7 Jul 1978 (GSFC)

BEGIN 17 April 1978 END 14 Jun 1978 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 400

PERTINENT DOCUMENTATION: GSFC SMR 38

DESCRIPTION: The RIPPLE correction constants K and A for LWR (see change of 11 May 1978) were initially set to the non-optimal values shown above at the two ground stations. Evaluation of spectra processed with those parameters indicated that the following values:

K = 231,150

A = 0.09,

were more appropriate, and the two ground stations adopted these values on the respective end dates shown above. With these new values, the limiting LWR ripple correction factor becomes 16.43.

* There is some uncertainty in the VILSPA records. The old GSFC values for LWR K and A may have been in use at VILSPA until approximately 3 May 1978 when the values K=231,075 and A=0.09 were adopted. What is more certain is that the optimal values K=231,150 and A=0.09 were in fact installed on the respective end dates shown above.

TITLE: Extract low dispersion spectra (EXTLOW) with HT=9 and DISTANCE=8.0. (Will not properly extract spectra of aperture-filling objects.).

DATA AFFECTED.

CAMERA: All DISPERSION: Low PROCESSING: Merged spectrum (extended objects in large aperture)

MEDIA: Tape, CalComp

DATES: BEGIN 20:30 22 May 1978 END 01 Aug 1978 (GSFC)

BEGIN N/A END 14 June 1978 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 50

PERTINENT DOCUMENTATION: GSFC SMR 42, CSC/TM-79/6301

DESCRIPTION: All low dispersion spectra processed with EXTLOW prior to the end date above were extracted using a slit height HT=9 (9 pixels on a diagonal) and with the background sampled at DISTANCE=8.0. While these parameters are appropriate for a point source, aperture-filling objects such as extended sources or trailed exposures require a longer slit to measure all of the flux in the large aperture and a more distant background sampling to avoid contamination from the aperture itself. Therefore, aperture-filling sources extracted before the end date would suffer too small a gross flux and too large a background flux. The amount of the error depends on the flux distribution within the aperture.

On the end date, an optional processing scheme for extended sources was defined, using HT=15 (longer than the large-aperture) and DISTANCE=11.0. The old parameters were also retained for use with point sources. Caution: See the change to EXTLOW on 1 March 1980 for information on the units of measure for DISTANCE.

Note: <At VILSPA the extended source option was provided earlier. Prior to EXTLOW installation date at VILSPA (14 June 1978) an equivalent extended source reduction scheme was provided using COMPARE (refer configuration #13).>

MEANS OF IDENTIFYING AFFECTED DATA:

- HT=9 written in IUESIPS history label by EXTLOW.

NO. 19 X

TITLE: Image sequence number sometimes zeroed out in scale factor record of merged spectral file.

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted spectra

MEDIA: Tape

DATES: BEGIN 3 April 1978 END 08 Aug 1978 (GSFC)

BEGIN 17 April 1978 END!17:00 01 Feb 1979! (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 20%

ESTIMATED NUMBER OF IMAGES AFFECTED: 300

PERTINENT DOCUMENTATION: GSFC SOCAR 141, SOCAR 145, SOCAR 150

DESCRIPTION: The program ETOEM which merges the gross, background, net, and absolutely-calibrated net spectra for tape output also creates the scale-factor record for that file. Bytes 13 and 14 of the scale record are supposed to contain the image sequence number in I*2 format. Until the end date shown, ETOEM was referencing the observer's comments section in line 4 of the IUE image label to obtain the image number. Although the image number was usually present in that location, it was not always there because it was manually keyed in at the time of observation. As a result, on those occasions when the area in the label searched was blank, a zero was transmitted to the merged-spectrum scale factor record in place of the correct image sequence number.

As of the change date above, ETOEM was modified to read the image sequence number from the system-generated bytes 53-56 of line 1 of the image label. These bytes contain the most reliable data in the image label pertaining to image number.

<VILSPA has a different format convention for the observers comments and all images will probably be affected.>

MEANS OF IDENTIFYING AFFECTED DATA:

- Image sequence number zero in merged-spectrum scale-factor record.

NO. 20X

TITLE: Determine LWR low dispersion wavelength calibrations from preliminary version of line library.

DATA AFFECTED:

CAMERA: LWR DISPERSION: Low PROCESSING: Extracted spectra

MEDIA: Tape, CalComp

DATES: BEGIN 3 April 1978 END 11 Aug 1978 (GSFC)

BEGIN 17 April 1978 END 17:00 01 Feb 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 400

PERTINENT DOCUMENTATION: "IUE Data Reduction III. Accuracy of Low Dispersion Wavelengths," NASA IUE NEWSLETTER No. 5, July 1979.

DESCRIPTION: The line library used to perform LWR low dispersion wavelength calibrations was found to contain several emission lines which were either misidentified, blended, or too faint. A new line library omitting such lines (see reference documentation above) was adopted as of 09 August 1978, but not used to generate a production calibration file until 11 August 1978.

There were no known ill effects associated with the use of the old line libraries. The use of the new line libraries is documented here only for completeness.

NO. 21 X

TITLE: Use of incorrect offsets from small to large aperture in LWR.

DATA AFFECTED:

CAMERA: LWR DISPERSION: Both PROCESSING: Extracted spectra (large aperture)

MEDIA: Tape, CalComp

DATES: BEGIN 3 April 1978 END 16:00 30 August 1978 (low) (GSFC)
18:00 31 August 1978 (high)
BEGIN 17 April 1978 END 17:00 01 Feb 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 600

PERTINENT DOCUMENTATION: GSFC SMR 46; "IUE Data Reduction V. Wavelength assignments for Large Aperture Spectra," NASA IUE Newsletter No. 6, Sept. 1979.

DESCRIPTION: Large-aperture dispersion constants are derived from the directly-measured small-aperture values by adding an offset to the zero-point terms (A1 and B1) corresponding to the separation of the apertures in samples and lines. (See reference documentation above) In the case of LWR, the offsets used in the wavelength-calibration schemes until 11 August 1978 were preliminary values:

$$\Delta S = -21.1$$
$$\Delta L = +25.1$$

Subsequent more accurate measurements made on geometrically-corrected calibration images with both apertures illuminated showed that better values* were

$$\Delta S = -17.5$$
$$\Delta L + +19.5$$

The effect of having used the older offsets was primarily to introduce a velocity-like shift of approximately -50 km/sec in the zero-point of LWR high dispersion extracted spectra. This arises because the vector between the old and the new offsets lies chiefly along the high dispersion orders and is approximately 6.7 pixels in length. There is little wavelength offset in low dispersion because the shift is nearly perpendicular to the dispersion and hence corrected by the registration step.

The new offset values were incorporated into the GSFC wavelength calibration schemes on 11 August 1978 and first used to generate calibration files on the respective end dates shown above for low and high dispersion.

* See also the change documented as of 08 July 1979.

NO. 21.1 ✓

TITLE: Error in SWP low dispersion wavelength scale.

DATA AFFECTED:

CAMERA: SWP DISPERSION: Low PROCESSING: Extracted spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN N/A* END N/A* (GSFC)

BEGIN 15 June 1978 END 07 September 1978 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 150

PERTINENT DOCUMENTATION: ESA IUE Newsletter No. 3 (July 1979); VILSPA

internal memos: {MP/cr-097 16 Aug 1978)
{JB/bm 6 Sep 1978)

DESCRIPTION: <All VILSPA SWP low dispersion data in the period were processed with dispersion constants which resulted in a noticeable systematic wavelength error. The computed scale is correct around 1250 Å and gives wavelengths too short by 10 Å near 1950 Å.

A suitable correction formula is:

$\lambda_{corrected} = -20.00 + (1.0158 \pm 0.0002) * \lambda_{tape}$

The calibration used was in use on 23 May 1978 at GSFC.>

* See also the discussion of the GSFC configuration ending 21 September 1978.

NO. 22 X

TITLE: Perform all registrations of spectral orders with dispersion-constant overlays manually

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 3 April 1978 END <02:00 10 Sept. 1978 (GSFC)

BEGIN 17 April 1978 END 17:00 01 Feb 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 3000

PERTINENT DOCUMENTATION: GSFC SMR 48

DESCRIPTION: Until the end dates shown above, the registration of spectral format with dispersion-constant overlays could only be performed by manual inspection of the images and overlays on the Experiment Display System (EDS) screen. The characteristics of shifts determined by this procedure are:

1) they are measured by eye and depend on an operator's judgment, and
2) they may be decomposed into arbitrary line and sample direction components yielding a net shift such that the spectrum coincides with the overlay. This is prone to being highly operator-dependent.

Operator guidelines were established to make all derived shifts in a direction perpendicular to the dispersion, on the theory that in the absence of specific knowledge to the contrary, the safest procedure is to apply a shift so as not to alter the wavelength assignments, i.e., a shift perpendicular to the dispersion. The strict adherence to such guidelines is operator-dependent, however, and it cannot be ruled out that arbitrary shifts in the wavelength scale (which would mimic velocity shifts in high dispersion, and would be constant-wavelength shifts in low dispersion) were induced by the registration step, with a magnitude corresponding to up to several pixels.

On the end dates above, a program with an automatic order-finding algorithm was implemented to calculate the perpendicular registration shifts * without operator intervention in most cases. Implementation of this software

(the program DSPCON) eliminates the undesirable characteristics (1) and (2) listed above. As implemented in production on the dates shown, DSPCON was not used for trailed or extended-source spectra, or for spectra which were either too intense (at least 4 of the 6 sampling areas saturated), too faint (insufficient contrast in at least 4 of the 6 sampling areas), or for cases in which the r.m.s. deviation from the mean of the shifts measured in the various sampling areas exceeded 1.0 pixel. In addition, DSPCON was limited to total shifts of 2.8 pixels because of the size of the sampling areas used.

* In some cases, the nominally perpendicular shifts calculated by DSPCON were not precisely perpendicular; see the change made on 18 August 1980.

NO. 23

TITLE: Camera number transmitted as true number plus 10 or 20 in scale factor record of merged spectral file.

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted spectra

MEDIA: Tape

DATES: BEGIN ≥ 2 Sept. 1978 END 20 Sept. 1978 (GSFC)

BEGIN ≥ 06 Nov. 1978 END 01 Feb. 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: > 20

PERTINENT DOCUMENTATION: GSFC SOCAR 151, CSC/TM-79/6301, OCC SIR 5355

DESCRIPTION: The program ETOEM accessed bytes 49 and 50 of record 1 of the IUESIPS label (see CSC/TM-79 6301) to obtain the camera number for the scale factor record of the merged spectral file. Until 2 September 1978, the OCC software which wrote record 1 of the label used the value 0 for the station flag in byte 49 for both NASA and ESA images, so that the camera number read by ETOEM was effectively correct. When the correct station flag values (1=NASA, 2=ESA) were put into the label beginning on 2 September 1978 with OCC software system 7 (see OCC SIR 5355), however, the 1 or 2 in byte 49 was included by ETOEM as part of the camera number passed to the merged spectral file.

The program ETOEM was modified on the end date above to access only byte 50 for the camera number. Therefore, all images acquired on or after 2 Sept. 1978 and processed prior to 20 Sept. 1978 will have incorrect camera numbers in the merged spectrum scale factor record. Because processing did not always follow the strict chronological order of image acquisition, a unique processing start date for the incorrect camera numbers is difficult to determine; the start date shown above is therefore indicated as ≥ 2 Sept. 1978.

MEANS OF IDENTIFYING AFFECTED DATA:

- Incorrect camera number in merged-spectrum scale factor record
- Acquisition date ≥ 2 Sept. 1978, processing date < 20 Sept. 1978. (GSFC)

NO. 24

TITLE: Determine SWP low dispersion wavelength calibrations from preliminary version of line library

DATA AFFECTED:

CAMERA: SWP DISPERSION: Low PROCESSING: Extracted spectra

MEDIA: Tape, CalComp

DATES: BEGIN 3 April 1978 END 07:00 21 Sept. 1978 (GSFC)

BEGIN 17 April 1978 END 17:00 01 Feb. 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 700

PERTINENT DOCUMENTATION: "IUE Data Reduction III. Accuracy of Low Dispersion Wavelengths," NASA IUE Newsletter No. 5, July 1979

DESCRIPTION: The line library used to perform SWP low dispersion wavelength calibrations was found to contain several emission lines which were either misidentified, blended, too faint, or contaminated by a reseau mark. The presence of these lines caused the calculated dispersion relations to vary from solution to solution (a new solution was obtained every several weeks) in a more or less random fashion. The worst problem associated with the use of this version of the line library was that the scale-factor terms of the dispersion relations (the A2 and B2 terms) exhibited spurious solution-to-solution excursions of up to ± 2%. As a result, wavelength scale errors of as much as ± 20 Å over the range from 1000 Å to 2000 Å were propagated to extracted spectra in those instances when the "bad" library entries were included in the dispersion solutions. In those instances when few (or no) "bad" entries were used in the solution, considerably smaller scale errors resulted, and in some cases quite accurate scales resulted.

The problem was eliminated with the adoption of a new SWP low dispersion line library which omitted the problem entries (see reference documentation above). The new library was adopted 09 August 1978 but not used to generate a production calibration file until 21 September 1978. However, the calibration in use from 13:00 27 July 1978 until 21 September 1978 was reasonably accurate even though it was derived from the old line library. Its scale terms differ by less than 0.2% from the scale terms of the mean dispersion constants adopted at GSFC on 18 July 1980, for example.

MEANS OF IDENTIFYING AFFECTED DATA:

- Values for the A2 and B2 scale terms of dispersion relations found in the IUESIPS history portion of label, which differ significantly from accurate values. This may be judged by comparison to the modern mean values, for example. The mean scale terms adopted on 18 July 1980 for SWP low dispersion are

  A2 = -.46657 pixels/Å (sample direction)

  B2 = .37616 pixels/Å (line direction).

NO. 25

TITLE: Extract low dispersion large aperture point-source spectra with DISTANCE = 8.0

DATA AFFECTED:

CAMERA: All DISPERSION: Low PROCESSING: Merged spectra (point-source, large-aperture)

MEDIA: Tape, CalComp

DATES: BEGIN 3 April 1978 END <15:57 25 Sept. 1978 (GSFC)

BEGIN 17 April 1978 END 17:00 01 Feb. 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 800

PERTINENT DOCUMENTATION: GSFC SMR 49, CSC/TM-79/6301

DESCRIPTION: Large-aperture low dispersion spectra extracted as point sources (HT=9) had background sampled at DISTANCE = 8.0 (see CSC/TM-79/6301). This has the disadvantage of measuring background levels with a slit partially inside the large aperture, which although safe at most wavelengths, presents a problem for SWP exposures with substantial geocoronal Lyman-alpha signal. In such cases, the geocoronal Lyman-alpha contaminates the smoothed background near λ = 1216 Å (±50 Å).

On the end dates indicated, the DISTANCE parameter was changed to 11.0 (same as for large-aperture extended-source reduction), nominally putting background sampling outside of large aperture*.

* See, however, the changes to EXTLOW made on 01 March 1980 at GSFC.

NO. 26

TITLE: Improper truncation of area of image photometrically corrected.

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: GPI, extracted spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 02 Oct. 1978 END 19:00 06 Oct. 1978 (GSFC)

BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 50

PERTINENT DOCUMENTATION: GSFC SMR 51, SMR 52

DESCRIPTION: A version of the photometric correction program which was intended to apply the photometric correction only within a circle of specified center and radius was introduced at GSFC and withdrawn 4 days later after it was determined that the program was not selecting the circular area properly. The short-lived version, called FICOR5, was found to be truncating useful data from the ends of certain orders (most severely in high dispersion) and was replaced with the former program, FICOR, which applies the photometric correction to the whole 768 x 768 image.

MEANS OF IDENTIFYING AFFECTED DATA:

- Program name FICOR5 (instead of FICOR) in IUESIPS history label during the 02 Oct.-06 Oct. 1978 time frame. (A corrected version of FICOR5 was eventually installed in December 1978 so only October 1978 FICOR5 results would be suspect.)
- Less than normal wavelength coverage in some orders.

NO. 27 X

TITLE: Automatic registration of spectral orders done using only 6 sampling areas in DSPCON

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 10 Sept. 1978 END 17:00 25 Oct. 1978 (GSFC)

BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 50%

ESTIMATED NUMBER OF IMAGES AFFECTED: 500

PERTINENT DOCUMENTATION: GSFC SMR 60

DESCRIPTION: The initial version of DSPCON used to perform automatic registration of spectral orders sampled only 6 areas of the image to do its cross-correlation order-finding calculation. On the date shown above, an updated version of DSPCON which extended the search to 6 additional areas was implemented. The wavelengths at which the new version samples the image to determine the shift are given in the following table.

SWP			LWR		
LOW	HIGH		LOW	HIGH	
λ	λ	m	λ	λ	m
1300	1465	94	2100	2360	98
1350	1475	94	2200	2370	98
1400	1530	90	2300	2460	94
1450	1540	90	2400	2470	94
1500	1600	86	2500	2570	90
1550	1610	86	2600	2580	90
1600	1680	82	2700	2690	86
1650	1690	82	2800	2700	86
1700	1765	78	2900	2820	82
1750	1775	78	3000	2830	82
1800	1860	74	3100	2960	78
1850	1870	74	3200	2970	78

NO. 28X

TITLE: Omit vacuum-to-air correction for LWR low-dispersion single-aperture reduction

DATA AFFECTED:

CAMERA: LWR DISPERSION: Low (single aperture only) PROCESSING: Extracted spectra

MEDIA: Tape, CalComp

DATES: BEGIN 04 Nov. 1978 END 5:30 15 Nov. 1978 (GSFC)

BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 20

PERTINENT DOCUMENTATION: GSFC SMR 63, SMR 65

DESCRIPTION: The vacuum-to-air wavelength correction normally performed on LWR spectra at $\lambda > 2000$ Å was inadvertantly left out of the processing of single-aperture LWR low dispersion spectra during the period designated, due to a clerical error in creating a more efficient processing scheme.

It is believed that all affected spectra were subsequently reprocessed correctly.

MEANS OF IDENTIFYING AFFECTED DATA:

- No discontinuity in assigned wavelengths at 2000 Å. (vacuum-to-air correction introduces a discontinuity of approximately 0.65 Å at 2000 Å.)

NO. 29

TITLE: Photometrically correct entire 768 x 768 image

DATA AFFECTED:

CAMERA: SWP DISPERSION: High PROCESSING: GPI

MEDIA: Tape, Photowrite

DATES: BEGIN 03 April 1978 END 20:50 10 Dec. 1978 (GSFC)

BEGIN 17 April 1978 END 7 March 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 1500

PERTINENT DOCUMENTATION: GSFC SMR 67

DESCRIPTION: With the exception at GSFC of the 4-day period ending 06 October 1978 (see change on that date), the entire 768 x 768 geometrically corrected image was photometrically corrected by the program FICOR. This was unnecessary and inefficient since the area outside of the target ring contains no image information. On the end date shown, the high dispersion SWP processing schemes were changed to use the program FICOR5, which photometrically corrects only the portion of the image within a circle of radius "RADIUS" and center line and sample coordinates CL and CS, where

RADIUS = 395.0

CL = 390.0

CS = 390.0

Outside of the area, the pixel values are set to the photometric offset value of 2000. This limitation increases the speed of execution without limiting the data actually extracted from the spectral orders.

MEANS OF IDENTIFYING DATA:

- Program name FICOR in image processing history portion of label
- Appearance of the GPI image

NO. 30

TITLE: Photometrically correct entire 768 x 768 image

DATA AFFECTED:

CAMERA: All DISPERSION: Low PROCESSING: GPI

MEDIA: Tape, Photowrite

DATES: BEGIN 03 April 1978 END 13 Dec. 1978 (GSFC)

BEGIN 17 April 1978 END 7 March 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 2500

PERTINENT DOCUMENTATION: GSFC SMR 68

DESCRIPTION: With the exception at GSFC of the 4-day period ending 06 October 1978 (see change on that date), the entire 768 x 768 geometrically corrected image was photometrically corrected by the program FICOR. This was unnecessary and inefficient since the area outside of the target ring contains no image information. On the end date shown, the low dispersion processing schemes for both SWP and LWR were changed to use the program FICOR5, which photometrically corrects only the portion of the image within a circle of radius "RADIUS" and center line and sample coordinates CL and CS, where

	SWP	LWR
RADIUS	= 395.0	RADIUS = 390.0
CL	= 405.0	CL = 400.0
CS	= 370.0	CS = 405.0

Outside of these areas, the pixel values are set to the photometric offset value of 2000. This limitation increases the speed of execution without limiting the data actually extracted from the spectral orders.

MEANS OF IDENTIFYING AFFECTED DATA:

- Program name FICOR in image processing history portion of label
- Appearance of the GPI image

NO. 31

TITLE: No information on values of OMEGA, HBACK, or DISTANCE in IUESIPS history labels.

DATA AFFECTED:

CAMERA: All DISPERSION: Low PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp

DATES: BEGIN 20:30 22 May 1978 END 13 December 1978 (GSFC)

BEGIN 14 June 1978 END 11:00 05 June 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 3000

PERTINENT DOCUMENTATION: GSFC SOCAR 155, CSC/TM-79/6301

DESCRIPTION: The extraction parameters OMEGA, HBACK, and DISTANCE (see CSC/TM-79/6301) pertinent to low dispersion processing with the program EXTLOW are selectable according to processing-scheme options. In practice, with EXTLOW the angle OMEGA was always set to 90.0, and the height of the background slits HBACK to 5.0, but the DISTANCE parameter describing the distance from the order to the center of background slit varied according to aperture selection and point-source/extended-source reduction selection. Full documentation of the extraction parameters actually used, therefore, requires these parameters in the IUESIPS label.

On the end dates shown, a revised version of EXTLOW which enters the OMEGA, HBACK, and DISTANCE values into the IUESIPS label was implemented.

MEANS OF IDENTIFYING AFFECTED DATA:

- No information on OMEGA, HBACK, or DISTANCE written in IUESIPS label.

NO. 32 X

TITLE: No information on values of automatic registration shifts recorded in IUESIPS history label

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted spectra

MEDIA: Tape, CalComp

DATES: BEGIN 10 Sept. 1978 END 13 Dec. 1978 (GSFC)

BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 50%

ESTIMATED NUMBER OF IMAGES AFFECTED: 1000

PERTINENT DOCUMENTATION: GSFC SOCAR 156

DESCRIPTION: The values of the line and sample shifts calculated and applied to the zero-point term of the dispersion constants by the program DSPCON were not recorded in the IUESIPS history label. Since these values indicate the magnitude of the shift applied to correct for thermal misregistration of the spectral format perpendicular to the orders, they also offer some indication of the possible uncertainties to be expected in the assigned wavelengths due to the (uncorrected) thermal misregistration along the orders.

Revised versions of the programs DATEXTH2 (for high dispersion) and EXTLOW (for low dispersion) were implemented on the end dates above so as to write the line and sample shift values into the IUESIPS history labels. (At VILSPA, this corresponds with the implementation of automatic registration software itself.) This change affects only those images shifted automatically; images shifted manually were given dummy line and sample shifts of "YY.YYY" and "XX.XX" respectively, for the label. The presence of the dummy values is thus an indicator that an image was registered manually. (Actual manual shifts were eventually recorded correctly in the label; see change of 05 April 1979).

MEANS OF IDENTIFYING AFFECTED DATA:

- No shift values in IUESIPS label

NO. 33

TITLE: Process order 65 in SWP high dispersion

DATA AFFECTED:

CAMERA: SWP DISPERSION: High PROCESSING: Extracted spectra

MEDIA: Tape, CalComp

DATES: BEGIN 3 April 1978 END 17:46 19 Dec 1978 (GSFC)

BEGIN 17 April 1978 END 14 Feb 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 1000

PERTINENT DOCUMENTATION: GSFC SMR 69

DESCRIPTION: In SWP high dispersion, echelle order 65 lies at the very edge of the tube and is generally difficult even to detect except after the (large) photometric correction is applied. The extracted spectrum for order 65 was extremely noisy and covered so small a wavelength range, that on the end dates shown, the SWP high dispersion processing schemes were altered to terminate the extraction procedure with order 66 (i.e., orders 125 - 66 extracted).

MEANS OF IDENTIFYING AFFECTED DATA:

- Extracted spectrum for order 65 present.

NO. 34 X

TITLE: Photometrically correct entire 768 x 768 image

DATA AFFECTED:

CAMERA: LWR DISPERSION: High PROCESSING: GPI

MEDIA: Tape, Photowrite

DATES: BEGIN 3 April 1978 END <5:07 04 Jan. 1979 (GSFC)

BEGIN 17 April 1978 END 07 Mar. 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 1500

PERTINENT DOCUMENTATION: GSFC SMR 70

DESCRIPTION: With the exception at GSFC of the 4-day period ending 06 October 1978, (see change on that date), the entire 768 x 768 geometrically corrected image was photometrically corrected by the program FICOR. This was unnecessary and inefficient since the area outside of the target ring contains no image information. On the end date shown, the high dispersion LWR processing schemes were changed to use the program FICOR5, which photometrically corrects only the portion of the image within a circle of radius "RADIUS" and center line and sample coordinates CL and CS, where

RADIUS = 390.0
CL = 395.0
CS = 390.0

Outside of this area, the pixel values are set to the photometric offset value of 2000. This limitation increases the speed of execution without limiting the data actually extracted from the spectral orders.

MEANS OF IDENTIFYING AFFECTED DATA:

- Program name FICOR in image processing history portion of label
- Appearance of the GPI image

NO. 34.1

TITLE: Dispersion constant and reseau calibrations used for VILSPA reductions (2)

DATA AFFECTED:

CAMERA: All DISPERSION: LWR-Both SWP-High PROCESSING: All Except RAW

MEDIA: Tape, Calcomp, Photowrite

DATES: BEGIN N/A END N/A (GSFC)

BEGIN 15 June 1978 END 17:00 01 Feb 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 1000

PERTINENT DOCUMENTATION: VILSPA TN/2003 - 00/AS/780614 (Release 10 File)

DESCRIPTION: <During this period the wavelength and geometry calibrations used for the reduction of all data acquired at VILSPA was that in use at GSFC on 23 May 1978.>

1.

NO. 34.2

TITLE: Dispersion constant and reseau calibrations used for VILSPA reductions (3)

DATA AFFECTED:

CAMERA: SWP DISPERSION: Low PROCESSING: Extracted spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN N/A END N/A (GSFC)

BEGIN 07 Sept. 1978 END 17:00 01 Feb. 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 300

PERTINENT DOCUMENTATION: VILSPA internal memo JB/bm 6 Sept. 78
VILSPA TN/2003-00/AS/780614 (Release 10 file)

DESCRIPTION: <The dispersion constant calibration file for SWP low dispersion data was based on image SWP 2244 acquired on 08 August 1978. This corrected the error described in the VILSPA configuration ending 07 September 1978. (No. 21.1) >

NO. 35

TITLE: Use incorrect version of ETOEM

DATA AFFECTED:

CAMERA: All DISPERSION: Low PROCESSING: ESSR

MEDIA: Tape

DATES: BEGIN 19 Jan. 1979 END 19:30 1 Feb. 1979 (GSFC)

BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 50

PERTINENT DOCUMENTATION: GSFC SOCAR 157

DESCRIPTION: During the affected time period, an incorrect version of the program ETOEM, which formats extracted spectra for the GO tape, was used. This version was implemented in an attempt to incorporate further information into the IUESIPS history portion of the image label of merged spectra. This version, however, did not function properly in the special case where only one spectral file is to be merged for tape (as is the case for the line-by-line spectral file, ESSR, in low dispersion).

On the end date, the original version of ETOEM was restored, and all known affected images were subsequently reprocessed. This change is documented here only for completeness.

NO. 36

TITLE: High dispersion partial processing on S/360 (VICAR)

DATA AFFECTED:

CAMERA: All DISPERSION: High PROCESSING: All

MEDIA: Tape, CalComp

DATES: BEGIN 3:00 25 Apr. 1978 END 6 Feb. 1979 (GSFC)

BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 75%

ESTIMATED NUMBER OF IMAGES AFFECTED: 1500

PERTINENT DOCUMENTATION: GSFC SMR 5, SMR 56

DESCRIPTION: During the affected period defined above, a number of high dispersion images were processed in part on the GSFC S/360 computers, under the VICAR system, as well as on the Sigma 9 computer under IUESIPS. In such cases, the geometric and photometric corrections, as well as the spectral registration step, were performed on the Sigma 9 and then further high dispersion processing (spectral extraction, manipulation, and plotting) was completed on the S/360. A requirement of processing on the S/360 under VICAR is that the image labels not exceed a limited size. As a result of this limitation, certain lines of the IUESIPS label were excised on the S/360: label lines 11-35, 38-45, 47-82, and 84-85 are missing from all image files processed on the S/360. These lines contain records of camera and SI procedures as well as various engineering data.

The partial processing on the S/360 was utilized in order to offload some of the large volume of data during the first year of operation and thus alleviate the significant backlogs which accrued. This capability was used primarily in 2 periods between the start and end dates shown above: 25 April 1978 to 10 July 1978 (period I) and 21 October 1978 to 6 February 1979 (period II). During period I, the raw and photometrically-corrected image files were written to tape on the Sigma 9

and hence only the extracted spectra have a truncated label. During period II, the raw and photometrically-corrected images were passed on an intermediate tape to the S/360 and were written to tape, along with the extracted spectra, in final form on the S/360 and hence all files have the truncated labels.

Subtle differences in the processing performed by the VICAR S/360 system and the Sigma 9 IUESIPS system may have existed, although benchmark reductions on both machines verified that no gross differences existed. The most serious difference was the loss of the label lines in the truncation process. Note also that the naming convention for the line and sample dispersion constants entered into the EBCDIC image labels of extracted spectra is reversed for spectra processed as the S/360, compared to most of the spectra processed on the Sigma 9: after 11 May 1978 (see change on that date) the naming convention adopted in CSC/TM-79/6301 is used on the Sigma 9. That is, the A_i coefficients are for the sample coordinates and the B_i coefficients are for the line coordinates. In the labels of spectra processed on the S/360, however, the A_i refer to the line coordinates and the B_i to the sample coordinates.

MEANS OF IDENTIFYING AFFECTED DATA:

- Abbreviated image-header labels (missing lines 11-35, 38-45, 47-82, 84-85) in extracted spectra. Note that for images processed during period II (see above), even the raw and photometrically-corrected image files have abbreviated labels although only the spectral extraction step is actually computed on the S/360.

NO. 37 X

TITLE: Use original IUESIPS File Management software

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: All

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 3 April 1978 END 9:00 09 Feb. 1979 (GSFC)

BEGIN 17 April 1978 END 11:00 05 June 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 5000

PERTINENT DOCUMENTATION:

DESCRIPTION: The original IUESIPS File Management software (the subsystem of IUESIPS which accesses, reads, and writes data files) was used until the end dates shown above (with the exception of the programs FICOR5, DATEXTH2, and EXTLOW at GSFC which were converted at 18:00 on 13 Feb. 1979). A new File Management subsystem was implemented to speed up IUESIPS production by eliminating the explicit zeroing-out of all output files prior to filling with true data. Extensive testing was performed to assure that this change had no effect on the final output products, and indeed the 4-day delay in converting the 3 programs mentioned above resulted from the need to modify their label-processing routines to function properly with unzeroed arrays. There are no known instances where use of the new File Management system changed any delivered output products; the existence of the change, however, is documented herein for completeness.

NO. 38

TITLE: No information on values of manual registration shifts recorded in IUESIPS history label

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted spectra

MEDIA: Tape, CalComp

DATES: BEGIN 03 April 1978 END 15:15 05 April 1979 (GSFC)

BEGIN 17 April 1978 END 17:00 01 Feb. 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 75%

ESTIMATED NUMBER OF IMAGES AFFECTED: 5000

PERTINENT DOCUMENTATION: GSFC SOCAR 158

DESCRIPTION: The values of the line and sample thermal registration shifts determined manually by operators were not recorded in the IUESIPS history label. For the same reasons cited in the discussion of the recording of automatically-determined shifts (see the 13 December 1978 change), such a situation was not advantageous.

The implementation of the new program REGISTER (an exact manual-shift analogue of the automatic-shift program DSPCON) on the end dates shown made it possible to insert the actual manual-shift values into the IUESIPS history label. This change thus replaced the dummy YY.YYY and XX.XX shift values that had appeared in manually-shifted image labels since 13 December 1978 at GSFC and 01 February 1979 at VILSPA; prior to those times, no value whatsoever appeared in image labels.

MEANS OF IDENTIFYING AFFECTED DATA:

- No true shift values (i.e., either blank or dummy values) in IUESIPS label.

NO. 39

TITLE: No output products generated for images designated "Do Not Process"

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: All

MEDIA: Tape

DATES: BEGIN 03 April 1978 END 30 April 1979 (GSFC)

BEGIN 17 April 1978 END (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 2%

ESTIMATED NUMBER OF IMAGES AFFECTED: 120

PERTINENT DOCUMENTATION: GSFC SMR 77

DESCRIPTION: Prior to the end date, all images designated by the original Guest Observer as "Do Not Process" were entirely disregarded. The disadvantage of this procedure is that images regarded as useless by the original Guest Observer may indeed have some value to other investigators and should at least be preserved in raw form for archival purposes. On the end date, a new processing scheme was implemented to copy to tape the raw data for any images marked "Do Not Process" (DNP) on the observing scripts, and at the same time to enter a comment into the image label indicating its disposition as an unprocessed image.

Retroactively, and at a relatively low priority, a program was initiated at GSFC to go back and recover from the operations raw-image archive tapes as many of the "DNP" images as possible, copying them in raw form to GO and NSSDC archive tapes. As of April 1981, approximately 30 such DNP images remained to be recovered.

<A similar program is to be carried out at VILSPA.>

NO. 40

TITLE: Improperly convert certain spectral files with negative fluxes to GO tape integer format.

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted Spectra

MEDIA: Tape

DATES: BEGIN 03 April 1978 END 19:00 07 June 1979 (GSFC)

BEGIN 17 April 1978 END 12 July 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: <5%

ESTIMATED NUMBER OF IMAGES AFFECTED: <300

PERTINENT DOCUMENTATION: GSFC SOCAR 176; "Improper Scaling of Certain IUE Spectral Files," NASA IUE Newsletter No. 7, Nov., 1979, p. 45; CSC/TM-79/6301.

DESCRIPTION: The program ITOE, which converts the IUE spectra extracted as floating-point FN values to scaled integers in preparation for writing to tape, incorrectly scaled spectra with negative extracted fluxes for which $|f_{min}|>|f_{max}|$ where f_{min} is the algebraic minimum flux value and f_{max} is the algebraic maximum flux value (see NASA IUE Newsletter No. 7, p.45). Typically, such a condition is most likely to be encountered in the background spectra of images with a low level radiation or halation background superposed on an abnormally low null pedestal. Since it is the low null level which leads to negative IUE fluxes (because of the manner in which the intensity transfer function is extrapolated at the low-intensity end), most images subject to the scaling problem were short exposures from the SWP camera, in which significant drifts of the null level were observed during the period in which the ITOE problem existed.

In cases where the extracted flux values are all negative, the incorrect scaling algorithm returned zero values for all integer fluxes and the J and K scale factors (see CSC/TM-79/6301, p. 8-37). In cases where some extracted flux values are positive but $|f_{min}|>|f_{max}|$ still applies, those negative fluxes algebraically less than $-f_{max}$ were incorrectly converted to integers, whereas all other fluxes were correctly scaled. A modified version of ITOE was implemented on the end dates shown to properly scale all spectra.

MEANS OF IDENTIFYING AFFECTED DATA:

- J,K and scaled flux values all set to zero; or more generally,
- Background on tape, when smoothed twice by a 15-point running-average filter, does not equal the background calculated by subtracting the net spectrum from the gross spectrum.

NO. 41 X

TITLE: All high dispersion extractions done with HT=5.

DATA AFFECTED:

CAMERA: All DISPERSION: High, large aperture PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp

DATES: BEGIN 03 April 1978 END 15:10 15 June 1979 (GSFC)

BEGIN 17 April 1978 END 16:00 10 Jan. 1980 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 700

PERTINENT DOCUMENTATION: GSFC SMR 82, CSC/TM-79/6301

DESCRIPTION: Prior to the end dates shown, all high dispersion spectral extractions were performed using the fixed parameter HT=5 (see CSC/TM-79/6301). Extended sources (such as planets and comets) sometimes yield order widths which exceed this slit height of 5-pixels on a diagonal, and hence for such sources not all gross flux was being extracted.

On the end dates shown, an "extended-source" option supporting a choice of HT=7 (which yields a slit which closely approximates the extent of the large aperture perpendicular to the dispersion) was made available in high dispersion, (manual-shift only). Note that with this change, although most of the gross flux is included in the extraction slit, there is more of a contamination problem for short wavelengths where the orders are close together.

MEANS OF IDENTIFYING AFFECTED DATA:

- HT value in IUESIPS history label

NO. 42

TITLE: Write redundant raw-image tape files for wavelength calibration images.

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Raw image
(Wavecal only)

MEDIA: Tape

DATES: BEGIN 03 April 1978 END 19 June 1979 (GSFC)

BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 150

PERTINENT DOCUMENTATION: GSFC SMR 81

DESCRIPTION: Wavelength calibration images were previously processed using several independent processing schemes which both wrote the raw image file to tape. On the end date, a set of streamlined calibration schemes was adopted which combined several steps into one and which further suppressed the writing of the raw file completely, since all wavelength calibration images were as of that date extracted as if they were normal spectral images.

In particular, for a low dispersion wavelength calibration image, the standard file sequence on tape changed from 1) raw image, 2) found reseau positions, 3) raw image, and 4) geometrically-corrected image, to 1) found reseau positions, 2) geometrically corrected image, followed by the standard set of normal-image tape files (RI, GPI, GPIS, ESSR, ESLO). For a high dispersion wavelength calibration image, the file sequence 1) raw image, and 2) geometrically-corrected image was changed to 1) geometrically corrected image followed by the normal-image tape files (RI, GPI, ESHI).

NO. 43

TITLE: No short header file written at beginning of GO tape

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: All

MEDIA: Tape

DATES: BEGIN 03 April 1978 END 02 July 1979 (GSFC)

BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 6000

PERTINENT DOCUMENTATION: CSC/TM-79/6301

DESCRIPTION: Prior to the end date above, no short header file was written at the beginning of each GO tape. This means that the first file on the tape is an actual data file, usually the raw image file for the first data set contained on the tape.

As of the end date, at GSFC only, a 1-record file of 360 bytes is written to each GO tape as it is mounted on the tape drive. This file precedes all actual data files on the tape and is an identifier used in the automated IUE Observatory accounting system. The format of this tape header file is shown in CSC/TM-79/6301, p. 8-11. It contains one line of EBCDIC text identifying the tape as a GO tape and giving the 7-character GSFC inventory number for that tape. Most GO's find it convenient to simply skip over this file when reading their tapes.

Note that as the tape header file is a GSFC IUE Observatory accounting device, it appears only on GO tapes originating at the GSFC IUE Observatory. In particular, tapes originating at VILSPA or produced from archives at the NSSDC would not contain the tape header file.

MEANS OF IDENTIFYING AFFECTED DATA:

- Lack of tape header file at beginning of tape.

NO. 44

TITLE: Use of SWP ITF with incorrect 20% exposure level

DATA AFFECTED:

CAMERA: SWP DISPERSION: Both PROCESSING: GPI, extracted spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 20:30 22 May 1978 END 19:40 07 Jul 1979 (GSFC)

BEGIN 14 Jun 1978 END 07 Aug 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 2000

PERTINENT DOCUMENTATION: GSFC SMR 85; "An Alert to IUE Users Regarding an Error in the SWP Photometric Correction," and "An Update on the SWP ITF Problem", both in NASA IUE Newsletter No. 7, November, 1979; CSC/TM-79/6301; "A Correction Algorithm for Low Dispersion SWP Spectra", "Correction of Data Affected by the SWP ITF Error", and "A Comparative Study of Five SWP Low-Dispersion Correction Algorithms", all in NASA IUE Newsletter No. 8, February, 1980. (ESA IUE Newsletters Nos. 4,5 and SRC IUE Newsletter No. 4).

DESCRIPTION: The 11-level SWP Intensity Transfer Function (ITF) installed at GSFC on 22 May 1978 contained a serious error in the 20% exposure level. This error was publicized in the "Alert to IUE Users Regarding an Error in the SWP Photometric Correction" mentioned above. It was caused when a blank image was accidentally averaged in with three valid 20% exposure images in constructing a mean 20% level for the ITF. As a result of this, the DN values assigned to each pixel in the 20% level of the ITF are only 0.75 times the correct value, which means that the FN value assigned in the photometric correction process to image pixels falling between the 10% and 40% exposure levels will be too large. Since FN=1084 is assigned to pixels at the 10% level and FN=4291 is assigned to pixels at the 40% level, any intermediate FN will be systematically too large, with the greatest error (63%) occurring at FN=2141. The "Update on the SWP ITF Problem" in

NASA IUE Newsletter No. 7 contained a table listing the percentage error in FN per pixel (defined as $FN_{old}/FN_{true}-1$) as a function of FN per pixel. This table is repeated here to serve as a guide to users in determining what data might be affected by this problem.

FN/pixel	% Error
1080	4%
1500	30%
2141	63%
2500	41%
2750	31%
3000	23%
3500	11%
4290	1%

Depending on whether the background or gross spectrum is within the susceptable range of FN per pixel, the net spectrum FN values may be too low or too high. The two references cited contain further details and discussion of the errors induced by the ITF problem.

A new SWP ITF with a correctly-generated 20% level (and slightly more accurate assigned effective exposure times*) was installed to correct the problem on the end dates shown above. Because of the seriousness of the problem, a considerable effort went into defining an after-the-fact correction algorithm that could be applied to rectify low dispersion SWP spectra processed with the bad ITF (see the last three documents listed above). Since a comparable correction algorithm could not be devised for high dispersion spectra, all high dispersion SWP spectra processed with the bad ITF were reprocessed at the originating ground station.

* As a result of the redefined exposure times, the maximum unsaturated flux number in SWP changed from 17740 to 17632.

MEANS OF IDENTIFYING AFFECTED DATA:

- The tables of T values printed in the IUESIPS history labels of photometrically corrected images (see CSC/TM-79/6301) represent the effective exposures, in units of 0.01 seconds, assigned to each level of the ITF. Since these values were refined at the same time the error in the 20% level was corrected, they may be used to discriminate which ITF version was used to process a given image. These values are:

Bad SWP ITF

0	1753	3461	6936	9000	10575
14299	17709	21546	25156	28674	

New SWP ITF

0	1684	3374	6873	9091	10586
14371	17745	21524	25105	28500	

NO. 45 X

TITLE: Use of non-optimal pixel offsets from small to large aperture

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted spectra (large aperture)

MEDIA: Tape, CalComp

DATES: BEGIN 03 April 1978 END 08 July 1979 (GSFC)

BEGIN 17 April 1978 END 16:00 10 Mar 1981 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 4000

PERTINENT DOCUMENTATION: GSFC SMR 84; "IUE Data Reduction V. Wavelength assignments for Large Aperture Spectra", NASA IUE Newsletter No. 6, Sept. 1979.

DESCRIPTION: On the basis of studies performed in 1979 it was determined that the ΔL and ΔS pixel offsets used to tie down the zero-points for large-aperture wavelength scales (see the IUE Newsletter report above) did not correspond precisely to the points within the large aperture of each camera at which telescope operations procedures normally placed objects. Because of this fact, there is implicit in all large-aperture spectra processed prior to 08 July 1979 at GSFC a small but systematic wavelength error. The magnitude and sign of this error depend on the camera and dispersion mode, as described in the above IUE Newsletter report. The table below lists the offsets in use prior to 08 July 1979 and compares them to the offsets to the actual object-placement points.

	SWP			LWR		
	Δ L px.	Δ S px.	R px.	Δ L px.	Δ S px.	R px.
OLD OFFSETS*	-20.0	-17.0	26.3	+19.5	-17.5	26.2
OFFSETS TO OBJECT PLACEMENT POINT	-19.9	-17.1	26.3	+20.4	-19.0	27.9

$$R = [(\Delta L)^2 + (\Delta S)^2]^{\frac{1}{2}}$$

* For LWR, the "old offset values" were used beginning August 30-31, 1978. See the change documented as of that date for the earlier values.

The difference between the two sets of offsets is converted below to induced wavelength errors (or for high dispersion, velocity-like errors) in the following sense:

$$\lambda_{old} = \lambda_{correct} + \Delta\lambda$$

$$\text{or} \quad \text{velocity}_{old} = \text{velocity}_{correct} + \Delta v$$

	SWP	LWR
Low Dispersion $\Delta\lambda$	+0.23 Å	-1.76 Å
High dispersion Δv	+0.13 km s^{-1}	+11.8 km s^{-1}

NO. 46

TITLE: Use pixel offsets from small to large aperture which do not correspond to physical center of large aperture

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted spectra (large aperture)

MEDIA: Tape, CalComp

DATES: BEGIN 03 April 1978 END 06 Aug. 1979
20 Sept. 1979 (LWR low) 29 Oct. 1979 (LWR low) (GSFC)
BEGIN 17 April 1978 END 16:00 10 Mar. 1981 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 4200

PERTINENT DOCUMENTATION: GSFC SMR 86; "IUE Data Reduction V. Wavelength Assignments for Large Aperture Spectra; NASA IUE Newsletter No. 6, Sept. 1979; GSFC SMR 106.

DESCRIPTION: As described in the Newsletter documentation above, prior to 1 August 1979 at GSFC, telescope operations procedures did not place point sources at the physical center of the large aperture during the acquisition process. When an operations change was made on that date to place objects at the physical center, a corresponding change was made to the ΔL and ΔS pixel offsets used by IUESIPS in establishing large-aperture wavelength scales so that all spectra acquired as of 1 August 1979 would be reduced using the correct offsets. This change was implemented in IUESIPS on 6 August 1979 at GSFC. The new offsets used are (in pixels):

SWP			LWR		
ΔL	ΔS	R	ΔL	ΔS	R
-19.7	-17.4	26.3	+19.4	-18.6	26.9

$$R = \left[(\Delta L)^2 + (\Delta S)^2\right]^{\frac{1}{2}}$$

These values may be compared to previous offsets as documented in the changes of 08 July 1979.

Due to a clerical error, the old offsets were inadvertantly reintroduced (for LWR low dispersion only) during the short period 20 September - 29 October 1979.

NO. 47 X

TITLE: Write geometrically-corrected-image tape file for wavelength calibration images.

DATA AFFECTED:

CAMERA: All DISPERSION: Both (Wavecal only) PROCESSING: Geometrically corrected image

MEDIA: Tape

DATES: BEGIN 03 April 1978 END 9 October 1979 (GSFC)

BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 175

PERTINENT DOCUMENTATION: GSFC SMR 93

DESCRIPTION: Wavelength calibration images were previously processed so as to write the geometrically-corrected image file to tape. Since the geometrically-and-photometrically-corrected image file (GPI) is also written to tape as part of the standard spectral-extraction processing now done on wavelength calibration images, the geometrically-corrected file is largely redundant data. On the end date, the writing of the geometrically-corrected file was suppressed.

With this change, for a low dispersion wavelength calibration image, the standard file sequence on tape goes from 1) found reseau positions, and 2) geometrically-corrected image, followed by the standard set of tape files (RI, GPI, GPIS, ESSR, ESLO), to 1) found reseau positions, followed by the standard set (RI, GPI, GPIS, ESSR, ESLO). For a high dispersion wavelength calibration image, the file sequence changes from 1) geometrically-corrected image, followed by standard set (RI, GPI, ESHI), to just the standard set of files (RI, GPI, ESHI).

NO. 48

TITLE: Use biweekly dispersion-constant calibrations in low dispersion

DATA AFFECTED:

CAMERA: All DISPERSION: Low PROCESSING: Extracted spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 03 April 1978 END 23:00 29 October 1979 (GSFC)

BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 4000

PERTINENT DOCUMENTATION: GSFC SOCAR 194, SMR 91, "IUE Data Reduction XI. Mean Dispersion Relations for Low Dispersion Spectra," NASA IUE Newsletter No. 7, Nov. 1979; "IUE Data Reduction XXI."

DESCRIPTION: As described in the above Newsletter article, prior to the end date shown the dispersion relations used to reduce IUE images were determined from new Pt-Ne lamp calibration images obtained approximately every two weeks. Although that procedure does insure that any long-term changes in the true dispersion relations are monitored, short-term changes due to thermal effects (which have timescales on the order of hours) are insufficiently sampled, and in particular one runs the risk of using an atypical calibration to reduce several weeks worth of subsequent images if an extreme thermal condition happened to exist at the time the calibration image was obtained. This is an important consideration since although long-term trends are now known to exist (see "IUE Data Reduction XXI"), short-term thermal effects are of major significance to the observed variations in spectral format, having an amplitude of up to several pixels. In low dispersion, thermal motions of the spectral format tend to be in the direction perpendicular to the dispersion (see "IUE Data Reduction XXI"), so that while the use of the biweekly calibrations may lead, on the average, to larger registration shifts, little wavelength error is introduced because the component of thermal motion along the low dispersion orders is small.

On the end date, mean dispersion relations were adopted (for low dispersion only) in all standard production schemes for current processing and reprocessing. The calibrations averaged together to form the means spanned the time period from GMT day 221, 1978 to GMT day 274, 1979. The adopted values are given in the table below (small aperture values),

	SWP	LWR
A_1	981.37	-298.22
A_2	- 0.46657	0.30242
B_1	- 263.68	-266.66
B_2	0.37618	0.22577

where sample $= A_1 + A_2 \lambda$

line $= B_1 + B_2 \lambda$

Note: For use of mean calibration files in high dispersion, see change as of 18 July 1980.

MEANS OF IDENTIFYING AFFECTED DATA:

- Values for the A_2 and B_2 dispersion-constant scale factors which are not equal to the mean values adopted on end date.

NO. 49 X

TITLE: Determine high dispersion wavelength calibrations from unrefined line libraries (version I libraries)

DATA AFFECTED:

CAMERA: SWP,LWR DISPERSION: High PROCESSING: Extracted spectra

MEDIA: Tape, CalComp

DATES: BEGIN 03 April 1978 END 14:00 23 Nov. 1979 (GSFC)

BEGIN 17 April 1978 END 16:00 10 Mar. 1981 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 4500

PERTINENT DOCUMENTATION: GSFC SMR 92, "IUE Data Reduction XX: High Dispersion Libraries", NASA IUE Newsletter No. 13, January 1981

DESCRIPTION: The line libraries used to determine the high dispersion wavelength scales prior to the end date were unrefined compilations of Pt-Ne emission line lists (version I libraries). These libraries were examined in 1979 in order to understand why many of the lines were chronically rejected during the regression analysis used by the program WAVECAL2 to determine dispersion relations (see IUE Data Reduction XX, above). It was found that many of the lines were either incorrect or inappropriate (lines with incorrect wavelength assignments; lines which are too faint, too bright, or blended; lines which fall near reseau marks; lines with close companions; lines which fall too near the edge of the tube). Such lines were deleted from the line libraries in three phases, the first of which was implemented on the end date shown above. (Also, see the changes as of 18 April 1980 and 29 August 1980).

The original SWP line library contained 243 lines; the original LWR library contained 219. The edited libraries implemented on the end date (version II libraries) contained 179 lines and 181 lines for SWP and LWR, respectively. The benefits realized by the use of the new libraries relate to a higher internal accuracy and incorporation of a greater fraction of the available lines into the final solutions (see IUE Data Reduction XX). The actual dispersion relations resulting from the modified libraries are

such that the pixel locations corresponding to a given wavelength would be identical (i.e., to better than 0.1 pixels) to those obtained from dispersion relations resulting from the original libraries. That is, there is no practical difference in the wavelength assignment for extracted spectra.

NO. 50 ✓

TITLE: Do not provide absolutely-calibrated net spectrum in low dispersion

DATA AFFECTED:

CAMERA: All DISPERSION: Low PROCESSING: Merged spectra

MEDIA: Tape, CalComp

DATES: BEGIN 03 April 1978 END 5:00 9 Jan. 1980 (GSFC)

BEGIN 17 April 1978 END 12 July 1979 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 5500

PERTINENT DOCUMENTATION: GSFC SMR 96; "IUE Data Reduction XII: Absolute Calibration of Low Dispersion Spectra," NASA IUE Newsletter No. 8, Feb. 1980; CSC/TM-79/6301; "Photometric Calibration of the International Ultraviolet Explorer (IUE): Low Dispersion," Astron. Astrophys. 85, 1980; Photometric Calibration of the IUE VII: Joint US/UK/ESA Revision to the IUE Absolute Calibration", NASA IUE Newsletter, No. 8, Feb. 1980. (ESA IUE Newsletter, No. 6.)

DESCRIPTION: Low dispersion spectra processed prior to the end dates shown did not include the absolutely-calibrated net signal: the "ABNET" portion of the merged spectral file (see CSC/TM-79/6301) was identical to the "NET" portion, being expressed as time-integrated, slit-integrated FN values. On the end dates above, the inverse sensitivity functions S_λ^{-1} for each camera were applied before writing the ABNET data:

$$\text{ABNET} \equiv S_\lambda^{-1} \times \text{FN(NET)} \qquad (\text{erg cm}^{-2}\ \text{Å}^{-1})$$

Note that the exposure time is not divided out, so that ABNET data are still time integrated.

Note also the following GSFC/VILSPA difference: On 12 July 1979 VILSPA began use of the S_λ^{-1} functions as originally published in Astron. Astrophys. as referenced above. On 9 January 1980 GSFC began use of the S_λ^{-1} functions modified at 1850 Å and 1900 Å as described in "Photometric Calibration of the IUE, VII," and interpolated as described in "IUE DATA Reduction, XII". (See also the change of 02 April 1980).

MEANS OF IDENTIFYING AFFECTED DATA:

- Magnitude of the uncalibrated ABNET data, when rescaled to floating-point values, will be large (i.e., typically 10^2-10^5 FN units), whereas the absolutely-calibrated ABNET spectral values will typically lie in the range 10^{-11} - 10^{-8} erg cm^{-2} $\AA^{-1}$

NO. 51

TITLE: Truncation of ITF at upper limit

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Photometrically corrected image, extracted spectra.

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 3 April 1978 END 16:55 8 Jan. 1980 (GSFC)

BEGIN 17 April 1978 END 16:00 1 Feb. 1980 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 11000

PERTINENT DOCUMENTATION: GSFC SMR's 98, 96 and SOCAR 201. "IUE Data Reduction XIII: Modification of Photometric Correction to Extrapolate the Intensity Transfer Function", NASA IUE Newsletter, No. 8, Feb. 1980.

DESCRIPTION: During this period FN values were determined by linear interpolation within the ITF table and linear extrapolation at the lower end of the table. In those cases where the observed DN value was greater than the largest DN in the ITF table the FN value of the largest DN in the table was assigned. After the end date of this period a new program (FICOR6) was implemented which differs from the old program in that it performs a linear extrapolation for DN's greater than the last unsaturated (saturation DN = 255) point in the ITF. The program uses the last two unsaturated points in the ITF to determine the slope for the extrapolation. If the extrapolated FN exceeds 32767 it is set equal to 32767; therefore, an FN of 32767 can indicate either an input DN of 255 (saturation) or an extrapolated FN limited by the 16 bit (halfword) integer format. All FN values of 32767 are flagged the same way by the ε field and appear on plots with a "+" symbol as either "saturated or limited extrapolation".

MEANS OF IDENTIFYING AFFECTED DATA: Spectra processed during this period were processed by a version of FICOR other than FICOR6. If FICOR6 is not listed in the history label some other version of photometric conversion was used.

NO. 52

TITLE: Incorrect units for the DISTANCE parameter in EXTLOW

DATA AFFECTED:

CAMERA: All DISPERSION: Low PROCESSING: Merged spectra

MEDIA: Tape, CalComp

DATES: BEGIN 20:30 22 May 1978 END 21:49 1 March 1980 GSFC

BEGIN 14 June 1978 END 12:30 6 March 1980 VILSPA

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 7000

PERTINENT DOCUMENTATION: GSFC SMR 99 and SOCAR 204. "Low Dispersion Background Extraction Error", NASA IUE Newsletter No. 9, April 1980.

DESCRIPTION: During this period the parameter, "DISTANCE", input to the extraction program EXTLOW to specify the distance between the dispersion line (center of on-order extraction) and the center of the background extraction slit specified this distance in PIXELS. Because of this, the background extraction slit was very close to or in many cases overlapping the gross extraction slit and/or the large aperture. After the end of this period the program EXTLOW was replaced by the program EXTLOW2 which takes the parameter "DISTANCE" in units of "diagonal pixels" where one diagonal pixel is equal to ($1 \times \sqrt{2}$) pixels. After this change the values assigned to the parameters input to EXTLOW2 remained the same as those previously used by EXTLOW. Therefore, the effect of the change was to move the background away from the spectrum by a factor of the square root of two ($\sqrt{2}$).

Throughout this period the small aperture gross extraction slit overlapped the background by 1.3 $\sqrt{2}$ pixels. After the end of the period it was separated from the background by $\sqrt{2}$ pixels.

For the large aperture point source mode the error has varied with time at GSFC as follows: (1) between 22 May 1978 and and 25 Sept. 1978 the background extended into the gross extraction slit by 1.3 $\sqrt{2}$ pixels (almost 1/2 the area of the background) (2) After 25 Sept. 1978 (See Configuration No. 25) there was a small gap of 0.78 $\sqrt{2}$ pixels between the gross extraction slit and the end of the background slit, and the background slit extended into the large aperture by about

0.2 $\sqrt{2}$ pixels, and (3) after 1 March 1980 the gap between the large aperture and the background slit became $3\sqrt{2}$ pixels and the gap between the background and the gross 4 $\sqrt{2}$ pixels.

In the large aperture extended source mode (this mode was not created until 1 Aug. 1978) the overlap throughout the period at GSFC was 2.2 $\sqrt{2}$ pixels between the background slit and the gross extraction slit and $0.2\sqrt{2}$ pixels between the large aperture and the background. After the end of this period the background slit was $3\sqrt{2}$ pixels from the large aperture and $1\sqrt{2}$ pixels from the gross extraction slit.

< For VILSPA data, the relevant dates are as follows:

(1) From 14 June 1978 to 31 Jan 1979
(2) After 01 Feb 1979
(3) After 06 Mar 1980

The extended source extraction mode was affected from 14 June 1978 until 06 Mar 1980 at VILSPA. >

MEANS OF IDENTIFYING AFFECTED DATA:

- After the end of this period the label for the extracted spectrum will contain the program name EXTLOW2. During the affected period the label will indicate EXTLOW.

NO. 53 ✓

TITLE: Use original Astron. Astrophys. absolute calibration

DATA AFFECTED:

CAMERA: All DISPERSION: Low PROCESSING: Merged Spectra

MEDIA: Tape, CalComp

DATES: BEGIN N/A END N/A (GSFC)

BEGIN 12 July 1979 END 14:00 02 April 1980 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 500

PERTINENT DOCUMENTATION: "Photometric Calibration of the International Ultraviolet Explorer (IUE): Low Dispersion," Astron. Astrophys. 85, 1980; "IUE Data Reduction XII: Absolute Calibration of Low Dispersion Spectra," NASA IUE Newsletter No. 8, Feb. 1980. (ESA IUE Newsletter #6).

DESCRIPTION: During the affected time period, at VILSPA only, the original low dispersion S_λ^{-1} functions as described in "Photometric Calibration of the International Ultraviolet Explorer (IUE): Low Dispersion" were utilized to provide the absolutely-calibrated spectrum. As of the end date, the modified S_λ^{-1} as described in "IUE Data Reduction XII" was adopted. These modifications involve a 14% reduction in S_λ^{-1} at 1850Å and a 6% reduction at 1900Å, a smooth interpolation to points on a 10Å grid in LWR and a 5Å grid in SWP, and the truncation of S_λ^{-1} to zero at the extremes of wavelength in each camera. With these changes, the S_λ^{-1} used at both GSFC and VILSPA are the same.

NO. 54 X

TITLE: Determine high dispersion wavelength calibrations from partially refined line libraries (version II libraries).

DATA AFFECTED:

CAMERA: SWP,LWR DISPERSION: High PROCESSING: Extracted spectra

MEDIA: Tape, CalComp

DATES: BEGIN 14:00 23 Nov. 1979 END 18 Apr. 1980 (GSFC)

BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 800

PERTINENT DOCUMENTATION: GSFC SMR 100, "IUE Data Reduction XX: High Dispersion Line Libraries", NASA IUE Newsletter No. 13, January 1981.

DESCRIPTION: The high dispersion line libraries used during the period shown above were partially-refined (version II) listings of Pt-Ne emission lines (see "IUE Data Reduction XX" and the changes of 23 November 1979). A further refinement was made on the end date above which resulted in new libraries (version III) containing 172 lines for SWP and 164 lines for LWR. As noted in the changes of 23 November 1979, the effects of this change relate principally to the internal consistency of the dispersion-constant solutions--no practical changes to the assigned wavelength scales of extracted spectra are realized.

No. 55 ✓

TITLE: Use biweekly reseau calibrations.

DATA AFFECTED:

CAMERA: LWR & SWP DISPERSION: Both PROCESSING: All but raw image

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 03 Apr. 1978 END 10:00 18 July 1980 (GSFC)
BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 11000

PERTINENT DOCUMENTATION: GSFC SMR 107, 103, 104; "IUE Data Reduction XVII., NASA IUE Newsletter No. 11, Oct. 1980.

DESCRIPTION: Prior to the end date shown the reseau positions used to correct the geometry of the IUE images were determined from new WAVECAL + TFLOOD calibration images taken approximately every two weeks. After the above end date a set of mean reseau positions were implemented based on 16 LWR 60% or 77% UVITF images exposed between day 73 of 1978 and day 204 of 1979 and 20 SWP 60% or 77% UVITF images exposed between day 85 of 1978 and day 334 of 1979. As noted in the above Newsletter article the chief advantage of mean files over the usual biweekly calibrations is that short term fluctuations are averaged out yielding calibrations more appropriate to the "typical" IUE image. UVITF images were used instead of WAVECAL + TFLOOD images since the former provide a flatter and less contaminated area for the FNDRES (reseaux finding) program to search.

Several impovements were made in the details of the FNDRES program in order to get the highest possible accuracy. An improved template for the large reseau in row 11, column 11 was used and three more reseaux in SWP and two more in LWR near the tube edges were added so as to reduce the amount of extrapolation needed to achieve the full 13-by-13 grid of reseaux used in the geometric correction process (see SMR 103 & 104).* Furthermore, the average positions found on the UVITF images with the improved FNDRES were calculated without the row-and-column smoothing procedure usually applied to reseaux measured on a single image. This smoothing was found to introduce errors.

* These changes to FNDRES were implemented 22 April 1980 and hence also pertain to the biweekly reseau calibrations generated between 22 April and 18 July 1980. On 31 May 1980, "naked" TFLOOD images (no platinum spectrum superposed) were first used for reseau positions accompanying WAVECALS.

TITLE: Use biweekly dispersion constant calibrations in high dispersion

DATA AFFECTED:

CAMERA: LWR & SWP DISPERSION: High PROCESSING: Extracted spectra

MEDIA: Tape, CalComp

DATES: BEGIN 03 Apr. 1978 END 10:00 18 July 1980 (GSFC)

BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 5000

PERTINENT DOCUMENTATION: GSFC SMR 107, 103 and 104, "IUE Data Reduction XVII, NASA IUE Newsletter, No. 11, Oct. 1980, "IUE Data Reduction XI, NASA IUE Newsletter, No. 7, Nov. 1979.

DESCRIPTION: During this period the dispersion relations used to reduce the IUE images were determined from new Pt-Ne lamp calibration images taken approximately every two weeks. As noted in the above Newsletter articles (see the change for 29 Oct. 1979 as well) the chief advantage of mean files over the usual biweekly calibrations is that thermal fluctuations are averaged out yielding calibrations more appropriate to the "typical" IUE image. As of the end date above, a set of mean dispersion constants for high dispersion was implemented. This set was based on 24 SWP and 24 LWR standard TFLOOD + WAVECAL high dispersion images acquired between 1 June 1979 and 1 June 1980. The dispersion relations determined from each of these images were averaged together term by term to define the set of mean high resolution dispersion constants given below:

(next page)

	SWP		LWR	
A_1	.787841752597664	D+3	-.512112131218370	D+4
A_2	-.174827009628957	D Ø	.149474938164753	D Ø
A_3	.128250164013606	D-5	-.557131203376991	D-6
A_4	Ø		.128677678460013	D-2
A_5	-.464346927595875	D Ø	.279988588392915	D Ø
A_6	Ø		Ø	
A_7	-.245917585466073	D-7	.964982411024015	D-7
B_1	-.624447811047980	D+4	.151718662770336	D+5
B_2	-.131942801615998	D Ø	-.275447072458253	D Ø
B_3	.127355792121042	D-5	.903443905778614	D-6
B_4	Ø		.661594536973941	D-1
B_5	.414873420270391	D Ø	.222497232868056	D Ø
B_6	.293871562110805	D-7	.225207671516958	D-7
B_7	-.286833642560946	D-6	.227041512913941	D-7

MEANS OF IDENTIFYING AFFECTED DATA:

- Values of the dispersion constants (given in image label) which differ from the above mean constants (aside from the A_1 and B_1 terms).

NO. 57

TITLE: Use of preliminary mean dispersion constants for low dispersion

DATA AFFECTED:

CAMERA: LWR & SWP DISPERSION: Low PROCESSING: Extracted spectra

MEDIA: Tape, CalComp

DATES: BEGIN 23:00 29 Oct. 1979 END 10:00 18 July 1980 GSFC

BEGIN N/A END N/A VILSPA

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 2000

PERTINENT DOCUMENTATION: GSFC SMR 107,103, and 104, "IUE Data Reduction XVII., NASA IUE Newsletter No. 11, Oct. 1980.

DESCRIPTION: During the period 29 Oct. 1979 to 18 July 1980 a set of preliminary mean dispersion relations were used (see change for 29 Oct. 1979) which were based on data obtained during the first year of IUE operation (GMT day 221 1978 to GMT day 274 1979). As noted in the above Newsletter article, studies of temporal and thermal variability of dispersion relations have shown that dispersion relations obtained during the first year of IUE operation may not be appropriate to use for current data. Therefore, at the end of the period a new set of dispersion constants was implemented, based on 24 SWP and 24 LWR standard TFLOOD + WAVECAL low dispersion images taken between 1 June 1979 and 1 June 1980. These new mean constants differ from the means reported in the change for 29 Oct. chiefly in the zero-point terms where the largest difference is +0.86 pixels. The largest difference in the scale term is 0.00002 pixels/Å.

The mean dispersion constants adopted for low dispersion on 18 July 1980 are given below:

Camera	Aperture	A_1	A_2	B_1	B_2
SWP	Small	982.21	-.46657	-263.44	.37616
LWR	Small	-298.63	.30244	-265.80	.22579

TITLE: Inaccurate automatic registration programs

DATA AFFECTED:

CAMERA: LWR & SWP DISPERSION: Both PROCESSING: Extracted spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 09 Sept. 1978 END 11:30 18 Aug. 1980 (GSFC)

BEGIN 25 Jan. 1979 END 22:00 30 Dec. 1980 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 50% (Automatic only)

ESTIMATED NUMBER OF IMAGES AFFECTED: 7000

PERTINENT DOCUMENTATION: GSFC SOCAR 211

DESCRIPTION: During the period indicated two errors existed in the automatic registration programs DSPCON and DCSHIFT: (1) the line and sample shift components calculated did not represent a shift perpendicular to the spectrum (the equations used to calculate the shift were incorrect), and (2) when the required shift was large (shift greater than 3.0 pixels perpendicular to the spectrum) the program would sometimes give a shift that was a gross underestimate (as much as 1.0 pixel too small) of the correct shift. At the end of this period these errors were corrected (note that an additional error was subsequently found in the corrected programs - see GSFC change for 19 Jan. 1981).

The errors caused by the first of these two problems vary in magnitude as a function of camera and dispersion. The following table lists the errors to be expected for the data reduced during this period (the values in the table can be added to the erroneous shifts, S_o and L_o, to get the correct shifts):

	Sample	Line
LWR - HIGH	S_o*(0.27) - .28	L_o*(-0.26) -0.20
LWR - LOW	S_o*(0.03) -0.21	L_o* (0.02) -0.28
SWP - HIGH	S_o*(0.24) -0.28	L_o*(-0.22) +0.22
SWP - LOW	S_o*(0.008) -0.22	L_o*(-0.004)-0.27

The magnitude of the error caused by the second problem above can be as large as ± 1.0 pixel in low dispersion and somewhat smaller in high dispersion.

Neither of these errors affected spectra which were trailed; during the affected time period all trailed spectra were manually registered.

MEANS OF IDENTIFYING AFFECTED DATA:

- If the line shift divided by the sample shift is exactly equal to (+ or -) the arctangent of 51°, the data were processed during this period and need correction (note that for SWP-Low, data processed after the end date will yield the arctangent of $51^{\circ}.12$).

NO. 59

TITLE: Determine high dispersion wavelength calibrations from further refinements to line libraries (version III libraries)

DATA AFFECTED:

CAMERA: SWP,LWR DISPERSION: High PROCESSING: Extracted spectra

MEDIA: Tape, CalComp

DATES: BEGIN 18 April 1980 END 29 August 1980 (GSFC)

BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 600

PERTINENT DOCUMENTATION: GSFC SMR 112, "IUE Data Reduction XX: High Dispersion Line Libraries".

DESCRIPTION: The high dispersion line libraries used during the period shown above were further-refined (version III) libraries (see "IUE Data Reduction XX", and the changes of 23 November 1979 and 18 April 1980). A final refinement, involving the deletion of marginally faint lines and lines with close companions, was made on the end date shown above, resulting in a final SWP library of 146 lines and a final LWR library of 145 lines (version IV libraries). As with the earlier changes, no practical effects on the assigned wavelength scales of extracted spectra are realized by this change.

NO. 59.1

TITLE: Incorrectly transmit 5-digit image sequence numbers to scale-factor record of extracted spectral files.

DATA AFFECTED:

CAMERA: SWP DISPERSION: Both PROCESSING: Extracted Spectra

MEDIA: Tape

DATES: BEGIN 03 Sept. 1980 END 18 Sept. 1980 (GSFC)

BEGIN 03 Sept. 1980 END 30 Sept. 1980 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 200

PERTINENT DOCUMENTATION: GSFC SOCAR 215

DESCRIPTION: For the SWP camera, 5-digit image sequence numbers were reached on 03 September 1980. The version of the program ETOEM in use at both ground stations at that time accessed only the right-most 4 digits of the image sequence number, so that SWP 10001 was transmitted to the scale-factor record of extracted spectral files as SWP 0001, SWP 10002 as SWP 0002, etc. The corrections to ETOEM allowing all 5 digits to be transmitted were made on the respective dates shown above.

MEANS OF IDENTIFYING AFFECTED DATA:

- SWP image numbers in the range 0000 to ~0250 written into the scale factor record of SWP imates acquired during September 1980.

NO. 60

TITLE: Processing of low dispersion spectra using the programs GEOM, FICOR and EXTLOW.

DATA AFFECTED:

CAMERA: LWR & SWP DISPERSION: Low PROCESSING: All but Raw image

MEDIA: Tape, CalComp, Photowrite, Printout

DATES: BEGIN 20:30 22 May 1978 END 00:11 04 Nov. 1980 GSFC

BEGIN 14 June 1978 END 16:00 10 Mar. 1981 VILSPA

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 10000

PERTINENT DOCUMENTATION: GSFC SMR 116;"Photometric Calibration of the IUE, VIII. Comprehensive Revision to the IUE Absolute Calibration in Low Dispersion", NASA IUE Newsletter No. 10, June 1980; "IUE DATA REDUCTION XVIII & XIX" NASA IUE Newsletter No. 12, Jan. 1981; "INTERNATIONAL ULTRAVIOLET EXPLORER IMAGE PROCESSING INFORMATION MANUAL, VERSION 1.0", CSC/TM-79/6301, 1979.

DESCRIPTION: A detailed description of the processing procedures used during the indicated period can be found in Version 1.0 of the Information Manual referred to above, and the two Newsletter articles listed can be consulted for the processing details in effect as of the end date for this period.

The output products produced during this period and those produced immediately after the end date differed in the manner shown by the following table:

During Period	After End Date
Photometrically and Geometrically corrected image provided. The entire image out to the edge of the roughly circular vidicon target is corrected.	Photometrically corrected image provided (same geometry as raw image). A band 160 pixels wide, centered between the large and small apertures, and parallel to the dispersion is the only part of the image corrected. Pixels outside this band are left as raw DN values.

During Period	After End Date
For the Photometrically and Geometrically corrected image the halfword pixel values are coded in a simple manner such that the relative flux (FN) equals the scaled value given unless the scaled value is 32767, in which case the pixel is saturated or extrapolated to the halfword limit (32767 is the largest FN possible).	The coding of the halfword pixels of the photometrically corrected image is designed to accommodate an extensive flagging system for exceptional pixels. The following conditions are flagged: (a) $-32767 \leq$ Scaled value ≤ -2049; Saturation (DN=255) or excessive extrapolation of ITF (b) $-2048 \leq$ Scaled Value < 0; Extrapolatin of upper end of ITF up to FN=65536 (c) $0 \leq$ Scaled Value ≤ 255; (No photometric correction raw DN outside of band) (d) $256 \leq$ Scaled Value < 32767; Normal interpolation of ITF up to FN=61534 or extrapolation to negative FN down to FN=-3488. For case (d) the relation between FN and the Scaled Value is FN=2*(Scaled Value - 2000). For cases (a)-(c), see IUE Data Reduction XVIII.
A 55-line Image Segment file was provided which consisted of the fluxes given in the line-by-line file. Each line was ~ 836 bytes long.	The Image Segment is not provided since the same information is in the line-by-line file.
The extracted spectrum files (line-by-line and merged spectra) have a data record length of 1204 bytes (up to 602 points per order). The scale factor record (record zero) does not contain target or engineering data.	Extracted spectrum files have a data record length of 2048 bytes, accommodating a total of 1022 points per order. The scale factor record contains such things as RA & DEC of target, camera temperatures and time of observation.

During Period	After End Date
Merged spectrum extracted from the photometrically and geometrically corrected image at an omega angle (see version 1.0 of IUE Information Manual for definition of omega angle) of 90° for all cameras, both apertures and all modes (Point source, Extended source, Trailed).	Merged spectrum derived directly from a summation at the correct omega angle of fluxes in the line-by-line spectrum. Different omega angles are used for each of the cameras, apertures and modes (a distinction is made between extended source and trailed).
The background spectrum is smoothed twice using a 15-point running average (this caused narrow defects such as reseaux, bright spots, and cosmic ray hits to be smoothed into the background).	The background is processed by a median filter (width 63 pixels) before a double mean filter of width 31 is applied (this rejects all narrow features including reseaux).
The data quality measure values (epsilons) are calculated using a formula that includes a term proportional to the distance of a pixel from the tube center. For the net spectrum the epsilons include a term for background reseaux.	There are only six possible values of epsilon (data quality measure) which signal six conditions (if more than one of the conditions occurs at that point the value for the worst case is given).
The order of the files for a double aperture image has the data for small aperture first.	The order of the files for a double aperture image has the data for small aperture last.
The absolute calibration of January 1980 is used (see GSFC change for 08 Jan. 1980).	The absolute calibration of May 1980 is used (see NASA IUE Newsletter No. 10).
Spectral data is extracted at an interval of 1.4 pixels from the resampled (smoothed) photometrically and geometrically corrected image.	Spectral data is extracted at an interval of 0.7 pixels from the raw image. The resulting spectral resolution is better than with the older method.

During Period	After End Date
The header at the beginning of the data files gives the names of the reduction programs in use (FICOR, GEOM, EXTLOW(2)).	The header at the beginning of the data files gives the names of the new reduction programs (PHOTOM, SPECLO, POSTLO) and in addition gives the time of the midpoint of the observation, the target coordinates, and a statement noting that either an automatic or a Manual Shift was used.

Data quality during this period was different from that after the end date as follows:

(1) The spectral resolution was not as good.

(2) Because of the broader extraction slit used there was less noise in the spectra (the same noise figure can be obtained for data extracted after the end date by binning the data).

(3) Reseaux and noise spikes are smoothed into the background spectrum and when it is then subtracted from the gross to produce the net erroneous broad dips or rises are produced.

(4) The well-corrected region of the SWP net spectrum ended at 1955 Å (after the end date it was extended to 1990 Å).

(5) The absolute calibration is slightly poorer (the improved calibration installed at the end date differed from the old calibration by as much as 10% in SWP and 6.3% in LWR).

Aside from the change in the absolute calibration, the changes made of the end of this period did not appreciably modify the photometric properties of the system (changes were less than 2%).

NO. 61

TITLE: Non-perpendicular manual shifts (REGISTER)

DATA AFFECTED:

CAMERA: LWR & SWP DISPERSION: Both PROCESSING: Extracted

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 20:30 22 May 1978 END 00:11, 04 Nov. 1980 GSFC

BEGIN 14 June 1978 END VILSPA

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 50%

ESTIMATED NUMBER OF IMAGES AFFECTED: 9000

PERTINENT DOCUMENTATION: GSFC SMR 116, SOCAR 216

DESCRIPTION: During this period, whenever it was necessary to register an image manually, the image processing specialist would display the image on the Experiment Display System (EDS) and estimate the shift in the sample direction and the line direction necessary to place the wavelength overlay (produced by the program OSCRIBE using the dispersion relation and displayed along with the image) on top of the spectrum. Misregistration of the image and the overlay is caused by thermal motion of the entire spectral format and will have components perpendicular to the dispersion direction and along the dispersion direction. Since the component along the dispersion was unknown, moving a given wavelength on the overlay along the dispersion is just as likely to increase the error as decrease it; therefore, every effort was made to estimate a shift that was perpendicular to the dispersion direction.

The shifts estimated were only approximately perpendicular to the dispersion so they could introduce arbitrary displacements along the dispersion of up to 3 pixels. After the end date a new program REG was implemented to replace the program REGISTER. This new program uses the line and sample shift supplied by the image processing specialist (this need not represent a shift perpendicular to the dispersion) to determine the correct components of an exactly perpendicular shift.

MEANS OF IDENTIFYING AFFECTED DATA:

- Erroneous shifts were usually integer values (see label). After the end date a message was added to the label noting that either an automatic or manual shift was made.

  <At VILSPA an extra label message was added before the original REGISTER program was withdrawn. The date of processing should always be used to identify affected VILSPA data.>

NO. 62 X

TITLE: Label lacks scheme name and AUTO/MANUAL message

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 03 Apr. 1978 END 00:11, 04 Nov. 1980 (GSFC) (GSFC)

BEGIN 17 Apr. 1978 END 16:42 30 Jan. 1981 (high)
16:00 10 Mar. 1981 (low) (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 19000

PERTINENT DOCUMENTATION: GSFC SMR 116, SOCAR's 216, 223, 224.

DESCRIPTION: During this period the image labels did not contain the name of the processing procedure ("Scheme") used or a notation indicating the type of registration shift applied (manual, automatic, or none). The registration shift information was not contained in the scale factor record ("record Ø") of the extracted files. After the end date the scheme name and shift information were added to the label and a flag was placed in word 62 of record Ø to indicate the type of shift used (Ø=no shift, 1=auto shift, 2=manual shift).

At VILSPA, these changes were implemented in two phases. On 30 Jan. 1981 the AUTO/MANUAL message was added to high dispersion labels; on 10 March 1981, the same was done for low dispersion and the scheme name was added for both dispersions.

NO. 63

TITLE: Incorrect manual shift for SWP images (REG)

DATA AFFECTED:

CAMERA: SWP DISPERSION: Both PROCESSING: Extracted spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 00:11, 04 Nov. END 05:00 26 Nov. 1980 (GSFC)

BEGIN N/A N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 50% (manual only)

ESTIMATED NUMBER OF IMAGES AFFECTED: 200

PERTINENT DOCUMENTATION: GSFC SOCAR 228

DESCRIPTION: During this period there was an error in the program REG such that it calculated shifts which were not perpendicular to the dispersion direction whenever it was used for an SWP image (LWR was done correctly). The error caused was equivalent to using the old program REGISTER, i.e., arbitrary displacements of the overlay and the dispersion relation along the spectrum (up to 3 pixels in the worst cases).

MEANS OF IDENTIFYING AFFECTED DATA: The label will note that a Manual shift was used and the entire shift will be in either the Sample direction or the Line direction.

NO. 64

TITLE: VBBLK without label processing

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Raw image (NSSDC tapes only)

MEDIA: Tape

DATES: BEGIN 10 Dec. 1979 END 22 Dec. 1980 (GSFC)

BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 4500

PERTINENT DOCUMENTATION: GSFC SMR 94; SOCAR 205

DESCRIPTION: This problem affected only those tapes sent to the National Space Science Data Center (NSSDC). Regular Guest Observer tapes were not affected.

During this period the IUESIPS program VBBLK created raw images with starting line (SL) and starting sample (SS) fields in the first line of the header label reading "0895" and "0895" instead of "0001" and "0001". After the end date this problem was corrected.

No. 65 X

TITLE: Incorrect entries in label by SPECLO (Declination and Zero Shift).

DATA AFFECTED:

CAMERA: All DISPERSION: Low PROCESSING: All but raw image

MEDIA: Tape, CalComp

DATES:	BEGIN	00:11	04 Nov. 1980	END	20:00	16 Jan. 1981	(GSFC)
	BEGIN	16:00	10 Mar. 1981	END		17 June 1981	(VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 50%
(only negative DEC and unshifted cases)

ESTIMATED NUMBER OF IMAGES AFFECTED: 300

PERTINENT DOCUMENTATION: GSFC SOCARS 231, 232; SMR 116

DESCRIPTION: During this period the declination of an object listed in the processing label on the line starting "TARGET COORD. (1950):" had the correct magnitude but the wrong sign for objects south of the Equator. In addition the line of the label giving the line and sample shift did not list the shifts as 0.0 when a shift was not used, but instead looked like the following:
"LINE SHIFT=YY.YYY SAMPLE SHIFT=XX.XXX"
After the end date these two errors were corrected.

No. 66 X

TITLE: Inaccurate automatic registration (LWR-LOW, SWP-HIGH and all Trailed).

DATA AFFECTED:

CAMERA: LWR & SWP DISPERSION: Both PROCESSING: Extracted spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 11:30 18 Aug. 1980 END 14:00 19 Jan. 1981 GSFC
BEGIN 22:00 30 Dec. 1980 END 17 June 1981 VILSPA

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 50% (automatic only)

ESTIMATED NUMBER OF IMAGES AFFECTED: 500

PERTINENT DOCUMENTATION: GSFC SOCAR 233

DESCRIPTION: During this period, LWR low dispersion, SWP high dispersion, and all trailed images were mis-registered by about 0.4 pixels. Since this is less than 10 percent of the length of the shortest slit used, the photometric error caused should be very small (in most cases the entire spectrum was still in the slit). The error in the dispersion direction would, in general, be less than this total error.

No. 67 X

TITLE: Calibration Files without temperature corrections (low dispersion).

DATA AFFECTED:

CAMERA: LWR & SWP DISPERSION: LOW PROCESSING; All But Raw Image

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 03 Apr. 1978 END 05:00 03 Mar. 1981 (GSFC)

BEGIN 17 Apr. 1978 END 11 Mar. 1982 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 12000

PERTINENT DOCUMENTATION GSFC SMR 118, and SOCAR's 238, 241, 240, 242; "IUE Data Reduction XXI", NASA IUE Newsletter No. 15.

DESCRIPTION: The IUESIPS processing software uses a set of displacements (determined from the reseaux on the tube faceplate) for each camera to correct each data image for geometric distortion, and a set of dispersion constants for each camera and dispersion mode (high, low) to determine the location of the spectrum for extraction and wavelength assignment. Primarily because of variations in spacecraft temperature at the time of observation the geometry of the image and the location of the spectral format on the camera faceplate change from image to image. Before the end date, no explicit thermal correction was applied to the calibration files.

During this period several changes were made to the processing software in an effort to use the best set of reseaux and dispersion constants for each image (see GSFC changes for: 22 May '78, 09 Jun. '78, 01 Jul. '78, 11 Aug. '78, 10 Sept. '78, 13 Nov. '79, 18 Apr. '80, 22 Apr. '80, 31 May '80, 18 Jul. '80, 18 Aug. '80, 29 Aug. '80, 04 Nov. '80 -- underlined dates are the most significant).

As of the end date for this change the displacement set used and the dispersion constants used were a function of the temperature at the time of the observation and the time of observation (the temperature used is referred to as the THDA and is usually available in the binary part of the image header). Before this change if an image were taken at a temperature which differed significantly from the temperature of the calibration files used, the wavelength assigned to a point on the spectrum would be incorrect. As an example, if the temperature of the image and the calibration file differed by 9° C for an SWP low dispersion image a wavelength error of over 2 A would result.

Those images processed during the period when bi-weekly calibrations were used are likely to show larger errors than images processed after the mean calibrations were implemented (the effective temperatures for the mean

calibrations were approximately 8° C for SWP and 13° C for LWR). The average (one standard deviation) wavelength error caused by using the mean calibrations (specifically the mean dispersion constants implemented on the end date of this change) instead of the temperature corrected calibrations is 0.16 Å for LWR-Low and 0.30 Å for SWP-Low (this corresponds to 0.06 pixels in LWR and 0.18 pixels in SWP along the spectrum).

Some of the bi-weekly calibrations were taken at temperatures very different from both the mean temperatures and the temperatures of the images processed using them; therefore, it would be possible to greatly improve the accuracy of the wavelengths of images taken during the bi-weekly calibration era.

The photometric quality of data processed before and after the end date differed very little. The data after the end date may be marginally less noisy (~5%), due to the use of the temperature corrected reseaux for the SWP camera. The reseaux motion is greatest for the SWP camera (it is at most ~0.9 pixels from the mean). For LWR the motion is so small (about 0.2 pixels from the mean) that the mean values were still used after the end date.*

In those cases where the date of observation or the temperature cannot be obtained from the label (all images prior to March 1979 lack the temperature and the date of observation) they will be entered manually (a comment in the processsing label will say "MANUAL OVERIDE") or mean calibrations will be used (a message in the label will note this). The mean dispersion constants to be used in such cases were implemented on the end date of this change. These new dispersion constants are slightly better than the July, 1980 set. The processing label for all images taken after the end date will contain the lines:

```
THDA FOR RESEAU MOTION =
THDA FOR SPECTRUM MOTION =
THERMAL SHIFTS:  LINE =      SAMPLE =
```

Any further shifting necessary to register the image, either manual or automatic, is recorded in the label under the name REGISTRATION SHIFTS: LINE = SAMPLE =

MEANS OF IDENTIFYING AFFECTED DATA:

- The messages to specify the temperatures used will not appear in the label.

* The mean reseau sets for both SWP and LWR were updated on the end date shown; details are given in configuration No. 73.

No. 68 X

TITLE: Use of preliminary parameters to specify the region to be processed by the program PHOTOM.

DATA AFFECTED:

CAMERA: All DISPERSION: LOW PROCESSING: All but raw image

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 00:11 04 Nov. 1980 END 05:00 03 Mar. 1981 (GSFC)
BEGIN 16:00 10 Mar. 1981 END 17 June 1981 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 1000

PERTINENT DOCUMENTATION: GSFC SOCAR 247

DESCRIPTION: During this period, the 160-pixel-wide band of the raw image which is photometrically corrected was slightly larger in the dispersion direction by roughly 2 and 15 pixels for SWP and LWR respectively. It was also displaced by several pixels (29 for SWP and 10 for LWR). The affect of this on the extracted data is to slightly change the endpoints of the spectrum (the shortest and longest wavelengths). Immediately after the end dates (3-5 March) the new smaller corrected area caused an error which is described in the GSFC change for 5 March 1981.

No. 69 X

TITLE: Use positional information to determine the bounds of the area of the to be extracted (SPECLO).

DATA AFFECTED:

CAMERA: ALL DISPERSION: Low PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp

DATES: BEGIN 00:11 04 Nov. 1980 END 05:00 05 Mar. 1981 GSFC
BEGIN 16:00 10 Mar. 1981 END 07 June 1981 VILSPA

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 1000

PERTINENT DOCUMENTATION: GSFC SOCAR 245

DESCRIPTION: During this period the program SPECLO extracted that part of the spectrum lying between two nominal (coded into the program) endpoint wavelenths as long as the center of the extraction slits for these wavelengths fell within a designated area of the image. If the sample and line position of the endpoint wavelengths slit center fell outside these bounds SPECLO substituted for that endpoint a new wavelength having a slit center just inside the area. Between 05:00 GMT, 3 Mar. 1981 and 05:00 GMT, 5 Mar. 1981 the area of the image which was photometrically corrected did not coincide with the area designated by SPECLO for extraction. Therefore, during this two-day period pixels outside the photometrically corrected area could be included in the gross flux extracted.

After the end date for this change SPECLO was modified so that it no longer used positional information to determine the starting and ending wavelengths of the spectrum to be extracted. Starting at one of two nominal endpoints supplied in the program and continuing to the other, the new version of SPECLO extracts the flux in slits spaced along the spectrum at an interval of 0.707 pixels. If any of the pixels in an extraction slit are flagged as raw data pixels (the area of raw data outside the photometrically corrected area is coded by the program PHOTOM to flag it as raw data - see GSFC changes for 4 Nov 1980) the flux from that slit and its corresponding wavelength are excluded from the extracted spectrum. The result of this is that SPECLO extracts all the data lying between the two nominal wavelengths and completely (in the sense that every pixel is checked) inside of the photometrically corrected area.

No. 70 X

TITLE: Unused lines of header label not blank-filled by POSTLO.

DATA AFFECTED:

CAMERA: All DISPERSION: Low PROCESSING: All but raw image

MEDIA: Tape, CalComp, Printout

DATES:	BEGIN	00:11	04 Nov. 1980	END	14:30 6 Mar. 1981	GSFC
	BEGIN	16:00	10 Mar. 1981	END	5 May 1981	VILSPA

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 1000

PERTINENT DOCUMENTATION: GSFC SOCAR 246

DESCRIPTION: During this period the program POSTLO did not fill unused lines of the header label or unused portions of lines with blanks (these parts of the label contained core garbage). Therefore, if the label is printed as an EBCDIC string some lines will contain arbitary characters. After the end date these lines were blank filled (i.e., the EBCDIC character, blank, was placed in each byte).

TITLE: Dispersion constant and reseau calibrations used for VILSPA reductions (4)

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: All Except Raw

MEDIA: Tape, Calcomp, Photowrite

DATES: BEGIN N/A END N/A (GSFC)

BEGIN 17:00 01 Feb 1979 END 16:00 10 Mar 1981 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: ~100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 2500

PERTINENT DOCUMENTATION:

VILSPA TN/2005 - 00/JB/790125	Release 12 file
TN/2006 - 00/JB/790605	Release 12B file
TN/2007 - 00/KN/800201	Release 12C file
TN/2008 - 00/KN/801230	Release 12D file

memo:

DESCRIPTION: <During this period almost all, if not all, data acquired at VILSPA was reduced using dispersion constant and reseau position calibrations dated 13 Nov. 1978 by GSFC. Data not reduced with these calibrations (if any) will have been reduced using a second "special" calibration optionally available to Guest Observers.

After 10 March 1981, the mean dispersion constants and reseau calibration described under configurations 55, 56, and 57 was installed for production use at VILSPA. (Since 30 Sept. 1980 they had been available as special calibrations).

The "special" calibration changed several times during this period. Relevant dates and cross references for the calibrations made available as "special" calibrations are:

i) Reseau files and high dispersion constants.

BEGIN 17:00 01 Feb. 1979 END 14:00 30 Sep. 1980

LWR - The 18 March 1978 calibration (refer to configuration (14.1))
SWP - The 23 May 1978 calibration (refer to configuration (34.1))
BEGIN 14:00 30 Sept. 1980 END 16:00 10 March 1981
The mean calibrations were available. (refer to configurations 55, 56)

ii) Low dispersion

BEGIN 17:00 01 Feb. 1979 END 18 Dec. 1979
LWR - The 18 March 1978 calibration (refer configuration (14.1))
SWP - The 23 May 1978 calibration (refer configuration (34.1))
BEGIN 18 Dec 1979 END 14:00 30 Sept. 1980
The preliminary mean low dispersion constants were available (configuration 57)
BEGIN 14:00 30 Sept. 1980 END 16:00 10 March 1981
The mean dispersion constants were available (refer to configuration No. 57)

iii) After 16:00 10 March 1981 the 13 Nov. 1978 calibration was installed as the "special" calibration>.

MEANS OF IDENTIFYING AFFECTED DATA:

Comparison of dispersion constants in label with the mean calibration values given in configuration descriptions 56, 57.

No. 72 X

TITLE: Use June 1979 - June 1980 mean dispersion constants in high dispersion.

DATA AFFECTED:

CAMERA: LWR & SWP DISPERSION: High PROCESSING: Extracted spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 10:00 18 July 1980 END 18:00 30 April 1981 (GSFC)
BEGIN 10 Mar. 1981 END (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 1800

PERTINENT DOCUMENTATION: GSFC SMR 120, SMR 107, "IUE Data Redution XVII" NASA IUE Newsletter No. 11, Oct. 1980; Configurations No. 56 and 67.

DESCRIPTION: The dispersion constants used during this time period represent an average of dispersion solutions obtained between June 1979 and June 1980. (See "IUE Data Reduction XVII" and Configuration No. 56). These constants were replaced on the end dates above with a new mean set of dispersion constants based on 41 SWP and 41 LWR calibration images obtained between March 1979 and January 1981. (Note that the improved mean dispersion constants for low dispersion mentioned in Configuration No. 67 refer to this same March 1979 - January 1981 time base), It was felt that the larger data base including more recent calibration images represented a more appropriate set for determining mean dispersion constants. The new constants are given below and should appear as shown in the header label of the extracted spectral file (aside from the $A_1 + B_1$ terms, which are subject to adjustment for thermal and registration shifts).

	SWP		LWR	
A_1	.981209330662201	D+3	-.509452651319565	D+4
A_2	-.177605064866280	D 0	.149251059715936	D 0
A_3	.129246425785837	D-5	-.556662198103489	D-6
A_4	.313148250186739	D-1	.218482361188139	D-2
A_5	-.465498655398958	D 0	.275161223903935	D 0
A_6	-.226814749601652	D-6	0	
A_7	-.143951757345994	D-7	.117217168885699	D-6
B_1	-.656637324319187	D+4	.154668450687027	D+5
B_2	-.127092427525431	D 0	-.277985820942175	D 0
B_3	.125533624294198	D-5	.908925575350436	D-6
B_4	0		.845592613048529	D-1
B_5	.407922452808576	D 0	.223410718083750	D 0
B_6	.172022377820959	D-7	-.766471494922043	D-7
B_7	-.237700930453820	D-6	.176976584255456	D-7

MEANS OF IDENTIFYING AFFECTED DATA:

- Values of the dispersion constants (given in image label) which differ from the above mean constants (aside from the A_1 and B_1 terms).

No. 73 X

TITLE: Calibration files without temperature corrections (high dispersion).

DATA AFFECTED:

CAMERA: LWR & SWP DISPERSION: High PROCESSING: All but raw image

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 03 April 1978 END 03:00 19 May 1981 (GSFC)
BEGIN 17 April 1978 END 11 Mar. 1982 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 9000

PERTINENT DOCUMENTATION: GSFC SMR 122; "IUE Data Reduction XXI," NASA IUE Newsletter No. 15, September 1981; Configurations No. 55, 56, and 67.

Description: In Configuration No. 67 the details relating to the switchover from mean to temperature-corrected calibration files for low dispersion processing were described. Similar considerations apply to the case of high dispersion documented here, with the addition of several numerical quantities pertinent specifically to high dispersion. Accordingly, the discussion from Configuration No. 67 is repeated herein where appropriate. The IUESIPS processing software uses a set of displacements (determined from the reseaux on the tube faceplate) for each camera to compensate for the effects of geometric distortion, and a set of dispersion constants for each camera and dispersion mode (high, low) to determine the location of the spectrum for extraction and wavelength assignment. Primarily because of variations in spacecraft temperature at the time of observation, the geometry of the image and the location of the spectral format on the camera faceplate change from image to image. Before the end date, no explicit thermal correction was applied to the calibration files.

As of the end date for this change the displacement set used and the dispersion constants used are a function of the temperature at the time of the observation and the time of observation (the temperature used is referred to as the THDA and is usually available in the binary part of the image header). Before this change if an image were taken at a temperature which differed significantly from the temperature of the calibration files used, the wavelength assigned to a point on the spectrum would be incorrect. As an example, if the temperature of the image and the calibration file differed by 3°C for an LWR high dispersion image, a wavelength error corresponding to ~14 km/sec would result. The average 1 σ scatter in the wavelength scale for images processed with the mean calibration files implemented on 30 April 1981 at GSFC corresponds to a velocity scatter of 8.4 km/sec in LWR and

4.5 km/sec in SWP; in the earlier era when biweekly calibrations were used (prior to 18 July 1980 at GSFC; see Configuration No. 56), the typical scatter would be considerably larger. However, after the temperature and time corrections implemented on the end dates of this configuration, the average 1 σ scatter is reduced to 2.7 km/sec for LWR and 2.0 km/sec for SWP. The photometric quality of data processed before and after the end date differed very little. After the end date, SWP data may be marginally less noisy (~5%), due to the use of the temperature-corrected reseaux for the SWP camera. The reseau motion is greatest for the SWP camera (it is at most ~0.9 pixels from the mean). For LWR, the motion is so small (about 0.2 pixels from the mean) that mean reseau positions were still used after the end date. Note, however, that for both cameras the baseline mean reseau set used as of the end date of this configuration represents a redefinition of the baseline from that implemented on 18 July 1980 (see Configuration No. 55). In this new baseline set, the same time period is spanned (day 73 of 1978 to day 204 of 1979 for LWR and day 85 of 1978 to day 334 of 1979 for SWP), but with several images having been dropped for lack of reliable temperature data, leaving a total of 15 LWR flat fields and 18 SWP flat fields in the baseline. (These new mean reseau sets were also implemented for low dispersion processing at the time temperature-corrected calibrations were implemented in low dispersion - 3 March 1981 at GSFC, Configuration No. 67).

In those cases where the date of observation or the temperature cannot be obtained from the label (all images prior to March 1979 lack reliable temperature and date of observation) they will be entered manually (a comment in the processing label will say "MANUAL OVERIDE") or the mean calibrations will be used (a message in the label will note this). The processing label for all images processed after the end date will contain the lines:

```
MEAN RESEAU    (followed by information identifying the baseline
                data set*)
MEAN DC        (followed by information identifying the baseline
                data set*)
THDA for RESEAU MOTION =
THDA for SPECTRUM MOTION =
THERMAL SHIFTS:  LINE =      SAMPLE =
```

Any further shifting necessary to register the image, either manual or automatic, is recorded in the label under the name
REGISTRATION SHIFTS: LINE = SAMPLE =

MEANS OF IDENTIFYING AFFECTED DATA:

- The messages to specify the temperatures used will not appear in the label.

* Detailed in "IUE Data Reduction XXI".

No. 74 X

TITLE: Use only two pass running average for background smoothing in high dispersion.

DATA AFFECTED:

CAMERA: All DISPERSION: High PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp

DATES:	BEGIN	03 April 1978	END	14:00 11 June 1981	(GSFC)
	BEGIN	17 April 1978	END	22:00 30 Dec. 1980	(VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 8000

PERTINENT DOCUMENTATION: VILSPA SMR R12D-1, GSFC SOCAR 263, GSFC SMR 124; "IUE Data Reduction X. Planned Changes to the Background Smoothing Algorithm," NASA IUE Newsletter No. 7, November 1979.

DESCRIPTION: Prior to the end dates given the extracted background was smoothed by two passes of a 15-point running-average filter. After the end date a 31-point median filter (program ESMOOTH) followed by the two-pass 15-point running average filter (program SMOOTH) was used. This is more effective at removing spikes (bright spots) and reseaux from the background than the previous filter. (See "IUE Data Reduction X" referenced above).

No. 75X

TITLE: Error in specifying the region to which the photometric correction is applied.

DATA AFFECTED:

CAMERA: LWR, SWP DISPERSION: Low PROCESSING: All but raw image

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 13:47 10 July 1981 END 19:35 24 July 1981 (GSFC)
BEGIN END (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 150

PERTINENT DOCUMENTATION: GSFC SOCARS 247, 274, Configurations No. 68, and 80.

DESCRIPTION: The new version of the photometric-correction program PHOTOM which was implemented at GSFC 10 July 1981 to improve the ITF extrapolation in low dispersion (see Configuration No. 79) inadvertently contained an outdated set of center and radius parameters. These parameters describe the region of the raw image file which is to be photometrically corrected and those inadvertently installed are the "preliminary" values referred to in Configuration No. 68. Only low dispersion images were affected, and the only effect on the extracted spectrum file would be a slight change in the value of the maximum extracted wavelength. (See Configuration No. 68).

No. 76 X

TITLE: Potential loss of lines in raw image.

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: All

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 03 April 1978? END < 14 Aug. 1981 (GSFC)
BEGIN END (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: << 1%

ESTIMATED NUMBER OF IMAGES AFFECTED: << 240

PERTINENT DOCUMENTATION GSFC SOCARS 197, 281

DESCRIPTION: The backup utility program ULTPIN, used to transfer raw images from tape to disk in those instances in which the primary tape-to-disk program VTAPEIN failed, was found to be potentially defective and was removed from use in mid-1981 at GSFC. ULTPIN was intended simply to attempt a greater number of retrys in reading image records, so that recoverable tape errors would not prevent accessing tape files. It was discovered, however, that when an irrecoverable read error was encountered, ULTPIN completely dropped (i.e., skipped over without any place-keeping) the affected lines(s) from the image and proceeded to read the remainder of the image without posting any messages or warnings. Such a problem obviously affects the usefulness of the scientific data by changing, in the line direction, the positions of the remaining lines of the image. At its worst, when several lines of the image were so dropped, this problem resulted in visible distortion, particularly after the geometric correction. When only single lines were dropped, however, the effect was essentially impossible to detect visually or by the other normal quality-control checking mechanisms.

There is uncertainty as to the exact time period over which ULTPIN may have been used, although an outside limit for its last use at GSFC is the end date above, which represents the initiation date for SOCAR 281 to correct the line-dropping problem. Subsequent versions of this program zero-filled bad records and posted warning messages.

The number of images estimated to have been affected by missing lines is very small, for two reasons. First, ULTPIN was generally used only as a third resort if the image file could not be transferred to the SIPS working disk area from the Shared Disk by IMAGEIN or from tape by VTAPEIN; the exact statistics of such occurrences are unavailable. Second, the use of ULTPIN does not necessarily imply loss of image lines; recoverable read errors could well be handled by ULTPIN without loss of data. Statistics as to the fraction of the time ULTPIN worked successfully are unavailable. The best estimate is

that far less than one percent of all images were affected by the data loss problem. Furthermore, it is expected that the majority of such instances would have occurred near the beginning of the time period involved, since a greater fraction of raw images were accessed from tape (rather than the Shared Disk) in 1978 and 1979, due to backlogs.

MEANS OF IDENTIFYING AFFECTED DATA:

- Distorted images (e.g., divergence of wavelength overlay from spectra order below certain point in image). It is likely that only those images for which 2 or more lines were dropped would be distorted badly enough to be obvious visually.

No. 77 X

TITLE: Non-optimal automatic registration of closely-spaced orders in high dispersion spectra.

DATA AFFECTED:

CAMERA: All DISPERSION: High PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 02:00 10 Sept. 1978 END 13:50 28 Aug. 1981 (GSFC)
BEGIN 17:00 01 Feb. 1979 END 11 Mar. 1982 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 40%

ESTIMATED NUMBER OF IMAGES AFFECTED: 3500

PERTINENT DOCUMENTATION: GSFC SOCAR 277, "IUE Data Reduction XXVI: Automatic Registration of the Extraction Slit with the Spectral Format," NASA IUE Newsletter No. 18, March 1982.

DESCRIPTION: Historically, the automatic registration shift applied in production processing was based on an average of 12 shifts calculated in various central spectral orders. It was discovered, however, that due to differential geometrical effects one registration shift does not necessarily apply equally well to all spectral orders, so that registering the central orders would in general result in a non-optimal registration for the closely-spaced orders. Since precise registration is crucial to the background extraction at the closely spaced orders, the registration routines DSPCON and DCSHIFT were modified as of the end date to determine a registration shift based on 12 search areas all in order 108. If an acceptable shift cannot be determined, the process is repeated for order 100, order 86 (82 for LWR) and finally (if necessary) order 77, as described in the IUE Data Reduction memo referenced above. The new registration technique results in lower extracted background flux levels for the closely-spaced orders.

No. 78 ✓

TITLE: Use preliminary ITF for LWP.

DATA AFFECTED:

CAMERA: LWP DISPERSION: Both PROCESSING: All but raw image

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 17 Aug. 1981 END 3 Nov. 1981 (GSFC)
BEGIN END (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 100

PERTINENT DOCUMENTATION: GSFC SMR 129

DESCRIPTION: Prior to the end dates indicated, the Intensity Transfer Function (ITF) in use for LWP processing, designated ITF0, used an effective exposure time of 20.22 seconds for the second level. By 3-Agency agreement, this effective exposure time was changed to 23.00 seconds on the end dates above, with the resulting ITF designated ITF1. The effect of using the preliminary ITF was to have assigned an FN approximately 12 percent too low to pixels at the second exposure level (FN = 1213 instead of FN = 1380), with corresponding reductions in FN for pixels interpolated between the first and second or the second and third levels.

MEANS OF IDENTIFYING DATA:

- Exposure time 2022 (instead of 2300) listed in the table of ITF exposure times included in the IUESIPS history label of photometrically corrected files.

No. 79

TITLE: Preliminary ITF extrapolation method used in photometric correction.

DATA AFFECTED:

CAMERA: ALL DISPERSION: Both PROCESSING: All but raw image

MEDIA: Tape, CalComp, Photowrite

DATES:	BEGIN	16:55	8 Jan. 1980	END	13:47	10 Jul. 1981	(low)	(GSFC)
					14:18	10 Nov. 1981	(high)	
	BEGIN	16:00	1 Feb. 1980	END		?	(low)	(VILSPA)
						11 Mar. 1982	(high)	

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 11000

PERTINENT DOCUMENTATION: GSFC SOCAR 257; "IUE Data Reduction XIII. Modification of Photometric Correction to Extrapolate the Intensity Transfer Function", NASA IUE Newsletter No. 8, February 1980; "IUE Data Reduction XVIII. Implementation of New Low Dispersion Software: Summary of Output Format Changes," NASA IUE Newsletter No. 12, January 1981; "IUE Data Reduction XXIII. Further Modifications to the Extrapolation of the Intensity Transfer Function," NASA IUE Newsletter No. 15, September 1981; "IUE Data Reduction XXIV. Implementation of New High Dispersion Software: Summary of Output Format Changes," NASA IUE Newsletter No. 18, March 1982.

DESCRIPTION: Under the ITF extrapolation procedures introduced on the start dates shown above (see "IUE Data Reduction XIII"), the maximum valid ITF DN level used for interpolation or to establish extrapolation was DN =254. In addition, the method of extrapolation involved an exact linear fit to the last two valid points of the ITF. On the end dates indicated, the maximum valid ITF DN level was redefined to be DN=250, and the method of extrapolation was modified to use a linear least-squares fit to the last 3 valid ITF points. (see "IUE Data Reduction XXIII"). These changes result primarily in a reduction in the occasional phenomenon of excessively large extrapolation.

Note that these changes were made only to the "new software" photometric correction routine PHOTOM, and hence the ITF extrapolation done in the high dispersion case unchanged until the new high dispersion software was implemented.

MEANS OF IDENTIFYING AFFECTED DATA:

- For low dispersion, the processing date must be used, since the version of PHOTOM employing the preliminary method of extrapolation was in production use until the end date shown.
- For high dispersion, the use of the "old software" photometric correction program (FICOR6) is, in addition to the processing date, an indication that the preliminary extrapolation method was used.

No. 80 X

TITLE: No flagging of LWR microphonic pings.

DATA AFFECTED:

CAMERA: LWR DISPERSION: Both PROCESSING: All†

MEDIA: Tape, CalComp

DATES:	BEGIN	3 April 1978	END	14:28 28 Sept. 1981 (low) 10 Nov. 1981 (high)	(GSFC)
	BEGIN	17 April 1978	END	11 Mar. 1982	(VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 11000

PERTINENT DOCUMENTATION: GSFC SOCAR 276, GSFC SMR 127, SOCAR 267

DESCRIPTION: Prior to the end dates indicated, standard production processing included no flagging of LWR data affected by microphonic noise. On those dates, the program MICRO was implemented in LWR processing schemes to screen raw images for microphonic pings (detected on the basis of image lines with peak-to-peak amplitudes $\geq$ 10 DN outside of the target ring). If microphonics noise of this nature is detected, the lines affected are flagged by an EBCDIC message in the image header label with the format:

PING! MICROPHONICS, AFFECTED LINES: nnn TO mmm

This message is subsequently decoded by the spectral extraction schemes such that flux points with contributions from the affected image lines are flagged by the epsilon value -220. The associated CalComp plots have such points plotted with the special symbol"*".

MEANS OF IDENTIFYING AFFECTED DATA:

- No reference to the program MICRO in IUESIPS history label.

† See also Configuration Number 81.

No. 81 X

TITLE: Microphonics flagging in the header label of the raw image file.

DATA AFFECTED:

CAMERA: LWR DISPERSION: Low PROCESSING: Raw Image

MEDIA: Tape, Photowrite

DATES: BEGIN 14:28 28 Sept. 1981 END 14:18 10 Nov. 1981 (GSFC)
BEGIN END (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 200

PERTINENT DOCUMENTATION: GSFC SMR 130

DESCRIPTION: When the application program MICRO was implemented to flag microphonic noise in LWR images (see Configuration No. 80) the processing schemes were modified to write the flagged raw image file to the GO tape rather than the unprocessed raw image file. Although the only difference between the 2 files was that the flagged image file had 2 extra lines added to the image label describing the location of the microphonic noise, it was decided that the raw image file would best be left as a totally unprocessed data file, thereby minimizing the risk of inadvertant damage due to undetected errors in applications programs. Note that the microphonics flagging is still contained in the labels of the other GO tape files and on the CalComp plot.

MEANS OF IDENTIFYING AFFECTED DATA:

- Records pertaining to MICRO will be found in history portion of image label.

No. 82 X

TITLE: Processing of high dispersion spectra using the programs GEOM, FICOR and DATEXTH (or DATEXTH2).

DATA AFFECTED:

CAMERA: All DISPERSION: High PROCESSING: All but raw image

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 03 April 1978 END 14:18 10 Nov. 1981 (LWR & SWP)
20:30 7 Jan. 1982 (LWP) (GSFC)

BEGIN 17 April 1978 END 11 Mar. 1982 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 10000

PERTINENT DOCUMENTATION: "IUE Data Reduction XVIII," NASA IUE Newsletter No. 12, January 1981; "IUE Data Reduction XXIV & XXV", NASA IUE Newsletter 18, March 1982; GSFC SMR 131, GSFC SOCAR 291 (LWP), IUE Image Processing Information Manual, Version 1.0 CSM/TM-79/6301 1979, or Version 1.1 CSC/TM-81/6268, 1981.

DESCRIPTION: A detailed description of the processing procedures used during the indicated period can be found in Version 1.0 (or 1.1) of the Information Manual referred to above, and the 3 Newsletter articles listed can be consulted for the processing details in effect as of the end date for this period.

The output products produced during this period and those produced immediately after the end date differed in the manner shown by the following table:

During Period	After End Date
Photometrically and geometrically corrected image provided. For the photometrically and geometrically corrected image the halfword pixel values are coded in a simple manner such that the relative flux (FN) equals the scaled value given unless the scaled value is 32767, in which case the pixel is saturated or extrapolated to the halfword limit (32767 is the largest FN possible).	Photometrically corrected image provided. The coding of the half-word pixels of the photometrically corrected image is designed to accommodate an extensive flagging system for exceptional pixels. The following conditions are flagged: (a) $-32767 \leqslant$ Scaled value $\leqslant -2049$; Saturation (DN=255) or excessive extrapolation of ITF.

During Period	After End Date
	(b) $-2048 \leq$ Scaled Value <0; Extrapolation of upper end of ITF up to FN=65536 (c) $0 \leq$ Scaled Value ≤ 255; No photometric correction, raw DN (d) $256 \leq$ Scaled Value < 32767; Normal interpolation of ITF up to FN=61534 or extrapolation to negative FN down to FN=-3488. For case (d) the relation between FN and the Scaled Value is FN=2x (Scaled Value - 2000). For cases (a) - (c), see "IUE Data Reduction XVIII"
Gross spectra extracted using slit length of $5\sqrt{2}$ pixels for point-source reduction mode and $7\sqrt{2}$ pixels for extended-source reduction mode.	Gross spectra extracted using a slit length which depends on order number for point-source reduction mode and which is constant (10 pixels) for extended source reduction mode. (See "IUE Data Reduction XXV")
The extracted spectrum file has a data record length of 1204 bytes (up to 602 points per order). The scale factor record (record zero) does not contain target or engineering data.	Extracted spectrum file has a data record length of 2048 bytes, accommodating a total of 1022 points per order. The scale factor record contains such things as RA & DEC of target, camera temperatures, and time of observation.
Spectral data are extracted at an interval of 1.4 pixels from the resampled (smoothed) photometrically and geometrically corrected image.	Spectral data are extracted at an interval of 0.7 pixels from the photometrically corrected image. The resulting spectral resolution is better than with the older method.
The background spectrum is extracted at positions determined by an algorithm which only approximates the midpoint between orders and in fact samples too close to the spectral order by an amount ~.07 times the true order separation.	The background spectrum is extracted closer to the true midpoint between orders.
The background spectrum is extracted without regard to the presence of reseaux, microphonic noise in LWR, and saturated pixels.	The background spectrum is extended excluding such points.

During Period	After End Date
The data quality measure values (epsilons) are calculated using a formula that includes a term proportional to the distance of a pixel from the tube center.	There are only a finite number of possible values of epsilon (data quality measure) which signal special conditions. (If more than one of the conditions occurs, the value for the worst case is given).
No heliocentric velocity correction applied to wavelength assignments.	Wavelengths are reduced to a heliocentric frame of reference on the basis of the target coordinates and the time of observation.
Vacuum-to-air wavelength correction applied for $\lambda \geq 2000$ Å in the LWR and LWP cameras only.	Vacuum-to-air wavelength correction applied for $\lambda \geq 2000$ Å in <u>all</u> cameras.
Net ripple-corrected fluxes are provided to the end points of each spectral order.	Net ripple-corrected fluxes are set to zero when $\lvert\lambda-\lambda_c\rvert > 2.6\ K/\pi m^2$ where K = ripple constant m = order number λ_c = blaze wavelength in Å ($=K/m$) λ = wavelength in Å (before corrections described above) Furthermore, a 7-point "optimal" filter is used to condition the noise inherent in raw IUE images as discussed in "IUE Data Reduction XXV."
The header label associated with the data files gives the names of the reduction programs in use (FICOR, GEOM, DATEXTH2).	The header label associated with the data files gives the names of the new reduction programs (PHOTOM, SPECHI, POSTHI) and in addition gives the time of the midpoint of the observation, the target coordinates, and a statement noting that either an automatic or a manual shift was used.

Data quality during this period was different from that after end end date as follows:

(1) The spectral resolution was not as good.

(2) Because of the broader extraction slit and geometric smoothing used, there was less noise apparent in the spectra.

(3) Reseaux and noise spikes are smoothed into the background spectrum, and when the background is then subtracted from the gross to produce the net, erroneous broad dips or rises are produced.

(4) The calculated net flux at the closely-spaced high orders was less due to the generally higher background flux level.

MEANS OF IDENTIFYING AFFECTED DATA:

- Program names GEOM, FICOR, DATEXTH2 in history label
- 1204-byte record lengths for extracted-spectrum files.

No. 83

Title: Round-off error in dispersion constants listed in record 0 of extracted spectral files.

DATA AFFECTED:

CAMERA: All DISPERSION: LOW PROCESSING: Extracted Spectra

MEDIA: Tape

DATES: BEGIN 18:10 03 Nov. 1980 (LWR, SWP) END 19:30 16 Nov. 1981 (GSFC)
17 Aug. 1981 (LWP)

BEGIN 16:00 10 Mar. 1981 11 Mar. 1982 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 4500

PERTINENT DOCUMENTATION: GSFC SOCAR 287

DESCRIPTION: Record 0 (the scale-factor record) of the extracted spectral file contains the first 12 significant digits of each dispersion constant and its exponent m when the value is expressed in the form: $0.nnnn....x\ 10^{\pm m}$. The twelfth digit was to be rounded off by adding 0.5×10^{-12} to the dispersion constant after dividing by the appropriate power of ten. During the period defined above, however, the program SPECLO was adding 0.5×10^{-12} before division by the power of ten. The result was that dispersion constants greater than or equal to 1.0 in absolute value would be rounded-off in a digit less significant than the twelfth and that dispersion constants less than 0.1 in absolute value would be rounded-off in a digit more significant than the twelfth. Dispersion constants with absolute value greater than or equal to 0.1 but less than 1.0 would not be affected. Since in low dispersion the dispersion constants are all greater than 0.1 in absolute value, the round-off error, when it occurred at all, was of the first type.

No. 84

TITLE: Camera and image sequence number of raw image (used for locating reseaux) not contained in first line of reseau-position data set.

DATA AFFECTED:

CAMERA: All DISPERSION: N/A PROCESSING: Reseau-position data-set

MEDIA: Tape

DATES: BEGIN 03 April 1978 END 15:10 23 Nov. 1981 (GSFC)
BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 400

PERTINENT DOCUMENTATION: GSFC SOCAR 248

DESCRIPTION: The reseau-position data set which contains the found reseau positions from a flood lamp image is written to the Guest Observer tape for special processing requests and to a "PHCAL" Guest Observer tape for the standard wavelength calibration processing. In both cases, prior to the end date the reseau file header label contained no identification in line 1 relating to the floodlamp camera and image number. Accordingly, a change was made to the reseau-finding program FNDRES so that bytes 41-72 of line 1 of the input floodlamp image label are copied into the same location of the output reseau file label. These bytes contain the camera, image number, station ID flag, etc., which are normally passed on to output files by IUESIPS processing so that reseau sets, like other derived files, can now be identified with the image from which they were derived.

MEANS OF IDENTIFYING AFFECTED DATA:

- Bytes 41-72 of reseau-file label are blank

No. 85 X

TITLE: Possible slight automatic registration errors.

DATA AFFECTED:

CAMERA: All DISPERSION: Low (old & new SW) PROCESSING: Extracted spectra
High (old SW)

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 02:00 10 Sept. 1978 END 16:20 24 Nov. 1981 (new low SW)
19:40 24 Nov. 1981 (old SW) (GSFC)

BEGIN 17:00 01 Feb. 1979 END (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 70%

ESTIMATED NUMBER OF IMAGES AFFECTED: 20,000

PERTINENT DOCUMENTATION: GSFC SOCARS 283,292,293,294,"IUE Data Reduction XXVI: Automatic Registration of the Extraction Slit with the Spectral Format", NASA IUE Newsletter No. 18, March 1982; Minutes of the Meeting of the IUE Users' Committee, March 1982, CSC/TM-82/6103.

DESCRIPTION: A number of changes to the automatic registration software, discussed below, were made during the period between 3 Nov. 1981 and 24 Nov. 1981. Note that no end date applies to the new high dispersion software, since the changes to the program DCSHIFT affecting high dispersion were already in place when the new high dispersion reduction software was implemented (see Configuration No. 82). Although all changes described herein were in place at GSFC by 24 Nov. 1981, certain of the changes were implemented earlier. Consequently, the effective time/date (at GSFC) for each change affecting the new low dispersion software is noted by each paragraph below. For the old software both in low and high dispersion, the effective implementation date of all changes is 19:40 24 Nov. 1981.

(continued on next page)

Trailed Spectra:

14:15 13 Nov. 1981 - The algorithm for calculating the automatic registration shift for low dispersion trailed images requires determining the point at which the square of the difference between the normalized template and image rowsums is a minimum. The software employed previously, however, because of a coding error, searched for the minimum of the difference times 2 rather than the difference squared. Although the magnitude of the resulting error cannot be calculated for the general case, tests made with pseudo-images showed the errors in the applied shifts to be less than 1 pixel.

14:15 13 Nov. 1981 - The previous software did not, in measuring shifts, discriminate against areas of LWR images affected by microphonic noise. The modified software uses the information provided by the microphonics detection program MICRO to ignore shifts determined in the regions containing microphonic noise. Errors in final shifts induced by microphonic contamination are expected to be quite small, since only a small number of search areas would be affected.

14:15 13 Nov. 1981 - The previous software did not discriminate against shifts measured at the very edge of a search area where proper interpolation of the fractional-pixel shift was not possible; the modified software does discriminate against such cases. It is doubtful, however, that any errors were induced by this effect since shifts as large as 6 pixels were allowed within the search area for trailed spectra.

16:20 24 Nov. 1981 - The previous software excluded search areas in which the maximum rowsum (see the referenced Newsletter report) divided by the minimum rowsum (i.e., background) was less than 1.5; here, a rowsum equals the total DN value of 3 diagonal pixels. In the modified software, the signal-to-noise test requires that the average DN of the 5 central rowsums minus the average DN of the 5 edge rowsums (i.e., background) be greater than 30 DN. The effect of the previous software was to exclude search areas containing high background levels, whereas such areas are now felt to be measureable.

16:20 24 Nov. 1981 - Under the previous software, if less than 4 of the 12 search areas were acceptable, manual registration would be required; under the modified software, at least 6 of the 12 search areas must be acceptable for automatic registration.

16:20 24 Nov. 1981 - The previous software excluded search areas if any rowsum was equal to 765 DN (3 x 255 DN). Since the template used for trailed images is primarily sensitive to the edges of the spectral order rather than a central peak as for point source images, this constraint was removed in the modified software. The previous software excluded certain search areas unnecessarily, which resulted in more images requiring the less accurate manual registration procedure.

Point Source Spectra

18:10 3 Nov. 1981 - The previous software could not determine shifts greater than 2.8 pixels in the direction perpendicular to the dispersion. The modified software employs a larger search area to allow shifts up to 3.5 pixels.

18:10 3 Nov. 1981 - As mentioned above for trailed spectra, the previous software did not discriminate against areas of LWR images affected by microphonic noise.

18:10 3 Nov. 1981 - The previous software allowed 2 of the 12 shifts to be measured at the very edge of a search area where proper interpolation was not possible; the modified software allows none.

18:10 3 Nov. 1981 - Under the previous software, shifts for at least 4 of the 12 search areas were required to be acceptable for automatic registration to occur; under the modified software, this number is increased to 6 of 12 search areas.

No. 86 X

TITLE: Redundant "L" in column 72 of label of certain processed data files sent to NSSDC.

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: All but raw image (NSSDC tapes only)

MEDIA Tape

DATES: BEGIN 10 Dec. 1979 END 13:21 29 April 1982 (GSFC)

BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 11000

PERTINENT DOCUMENTATION: GSFC PPMR 306; CSC/TM-79/6301 or CSC/TM-81/6268.

DESCRIPTION: This problem affected only those tapes sent to the National Space Science Data Center (NSSDC). Regular Guest Observer tapes were not affected. The EBCDIC character "L" in column 72 of a header label record is used to signal the end of header label information. (See CSC TM's referenced above). Prior to the end date, the applications program VBBLK, which writes data files in blocked format for use at the NSSDC, incorrectly wrote an "L" into column 72 of the last 2 lines (logical records) of the header label for any file which did not contain an integer multiple of 5 lines in the label.

MEANS OF IDENTIFYING AFFECTED DATA:

- "L" in last 2 logical records of label.

No. 87

TITLE: Incompletely extract data from last spectral order of high dispersion spectra.

DATA AFFECTED:

CAMERA: All DISPERSION: High PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp

DATES: BEGIN 14:18 10 Nov. 1981 (LWR,SWP) END 16:45 05 May 1982 (GSFC)
20:30 07 Jan. 1982 (LWP)

BEGIN 11 Mar. 1982 END 07 Jul. 1982 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 1000

PERTINENT DOCUMENTATION: GSFC SOCAR 300

DESCRIPTION: During the time period indicated, the applications program POSTHI did not read the last data record from the output files of an intermediate program step (SORTHI). Since the last data record was generally only partially filled, this meant that between 1 and 60 data points were being excluded from the last order contained in the MEHI file and displayed on the CalComp plot. (In some cases the last order did not appear at all on the CalComp; however, at least part of the data from the last order was always included in the MEHI file). In the test run conducted using corrected software for an SWP image, only 4 points were added to order 66 in the MEHI file. Note that because of the 63-point smoothing applied to the extracted background flux before the NET and ABNET fluxes are calculated, the added data points will change the last 31 NET and ABNET flux values in the last extracted spectral order.

No. 88

TITLE: Error in the observation date calculation used in the high dispersion heliocentric velocity correction (and written to the header label for both dispersion modes).

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp

DATES:	BEGIN	00:11	04 Nov. 1980 (low)	END	13:47	6 May 1982 (Low)	
		14:18	10 Nov. 1981 (high)		16:45	5 May 1982 (High)	(GSFC)
	BEGIN	16:00	10 Mar. 1981 (Low)	END		7 Jul. 1982	(VILSPA)
			11 Mar. 1982 (High)				

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 2%

ESTIMATED NUMBER OF IMAGES AFFECTED: 150

PERTINENT DOCUMENTATION: GSFC PPMR 313, 314, CSC/TM-79/6301 or CSC/TM-81/6268

DESCRIPTION: The midpoint of observation is calculated by locating the time of the end of exposure in the event status portion of the image header label (lines 10-32; see CSC TM's referenced above) and subtracting half of the exposure (duration) time specified in line 2 of the header label. Although this technique will only be as accurate as the extracted label information mentioned above, it was found that the programs POSTHI and SPECLO were not reading the event status entry given in line 10 of the header label. If the time of end of exposure happened to be specified in this particular entry (out of the total of 45 entries) the above programs would write an anomalous observation date into the processing history portion of the header label and POSTHI would apply an incorrect velocity correction to the ABNET wavelength assignments.

MEANS OF IDENTIFYING AFFECTED DATA:

- Inspection of observation time recorded in processing history portion of label.
- Inspection of event-status entries in label to determine whether the end-of-exposure command for the image in question is in line 10 of label. The software identifies end-of-exposure commands by an initial 12-byte EBCDIC character string of the form.

"hhmmss FIN n"

where hh = hours
mm = minutes
ss = seconds
n = camera number.

The most recent (i.e., latest time) entry of this form above the double blank lines in the event status section, for which the camera number agrees with the camera number specified in line 1 of the label, is the one selected by the software to represent the end of exposure.

No. 89 X

TITLE: Error in handling negative declination values in high dispersion processing.

DATA AFFECTED

CAMERA: All DISPERSION: High PROCESSING: Extracted spectra

MEDIA: Tape

DATES: BEGIN 14:18 10 Nov. 1981 END 14:40 5 Aug. 1982 (GSFC)
BEGIN 11 Mar. 1982 END 19 Oct. 1982 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 50%

ESTIMATED NUMBER OF IMAGES AFFECTED: 750

PERTINENT DOCUMENTATION: GSFC PPMR 318; "IUE Data Reduction XXVIII," NASA IUE Newsletter No. 20, January 1983.

DESCRIPTION: Two errors existed in the way in which negative declination values were handled by the program POSTHI, which performs post-extraction processing of high-dispersion spectra.

1. The declination value used in the heliocentric velocity correction procedure was calculated by adding the minutes and seconds of declination (as positive quantities) to the degrees of declination regardless of whether the degrees term was positive or negative. This resulted in errors of up to 2 degrees in the declination value, which in turn resulted in small errors in the net velocity correction because of the erroneous line-of-sight.

2. The sign for negative declinations did not appear in the portion of the processing-history label where the target coordinates actually used are specified (the label line beginning "TARGET COORD, (1950):").

On the end date shown above, these problems were corrected. These changes were also announced in the Newsletter article referenced above.

MEANS OF IDENTIFYING AFFECTED DATA:

- Negative declination value stored in line 37 of header label (as written by operations software), but negative sign missing in processing history label line referred to above.

No. 90

TITLE: Error in scaling net ripple-corrected fluxes in high dispersion.

DATA AFFECTED:

CAMERA: All DISPERSION: High PROCESSING: Extracted spectra

MEDIA: Tape

DATES: BEGIN 14:18 10 Nov. 1981 END 14:40 05 Aug. 1982 (GSFC)
BEGIN 11 Mar. 1982 END 16 Jul. 1982 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 1500

PERTINENT DOCUMENTATION: VILSPA Software Modification Report R14A-1, GSFC PPMR 324, "IUE Data Reduction XXVIII," NASA IUE Newsletter No. 20, January 1983.

DESCRIPTION An error existed in the scaling of the ripple-corrected net spectral fluxes generated by the program POSTHI. The conversion of floating-point ripple-corrected net flux values to scaled-integer fluxes for inclusion in the MEHI tape file was incorrectly done on the basis of the maximum and minimum floating-point values for the uncorrected net flux. This caused any ripple-corrected net flux value exceeding the maximum uncorreced net flux to be interpreted on tape as a negative value.

This problem was corrected on the end dates shown above and was also discussed in the Newsletter article referenced.

MEANS OF IDENTIFYING AFFECTED DATA

- Incongruously negative flux values in the net ripple-corrected spectrum on the GO tape.

No. 91

TITLE: Perform photometric correction in low dispersion (under new software) without spatial truncation due to partial-read boundaries.

DATA AFFECTED

CAMERA: All DISPERSION: Low PROCESSING: PI only

MEDIA: Tape, Photowrite

DATES: BEGIN 00:11 04 Nov. 1980 END 19:45 27 Aug. 1982 (GSFC)
17 Aug. 1981 (LWP)

BEGIN 16:00 10 Mar. 1981 END 19 Oct. 1982 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 7500

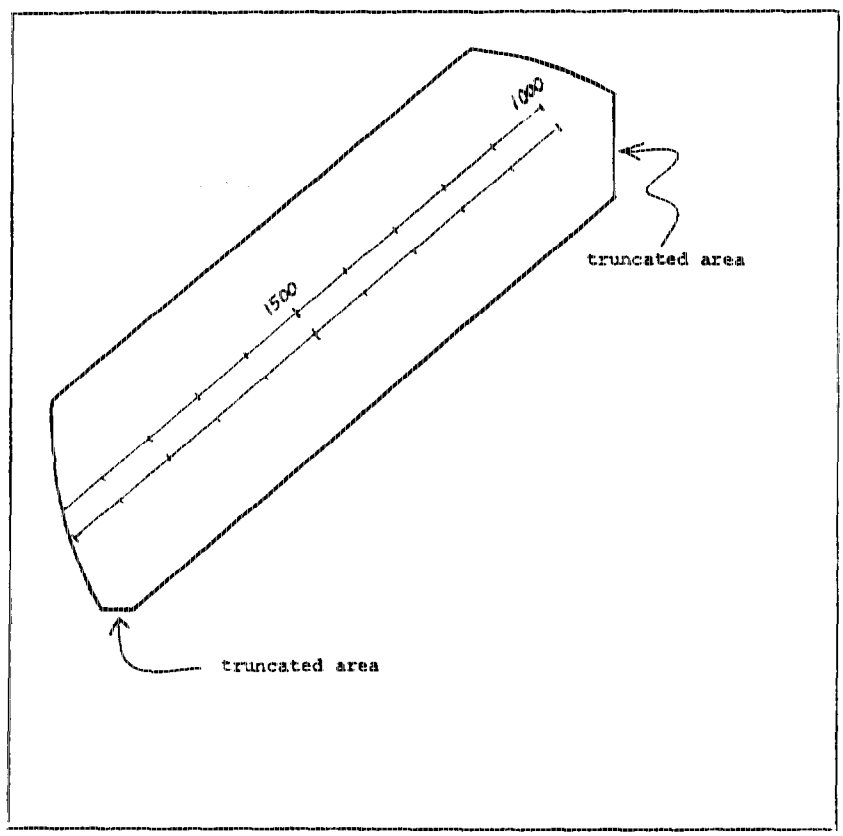
PERTINENT DOCUMENTATION GSFC PPMR 321; "IUE Data Reduction XXIX", NASA IUE Newsletter No. 20, January 1983.

DESCRIPTION: Since the start up of the new reduction software on the start dates shown above, the photometric correction for low dispersion images has been done only within a swath surrounding the spectral order. The possibility that "partial-read" images (images for which only a rectangular portion of the vidicon target, encompassing the low-dispersion spectrum, is read out) may become a user option prompted the development of a means of handling the photometric correction in low dispersion so as to facilitate partial-read image processing.

Therefore, the program PHOTOM was changed on the end dates shown so that for all low dispersion images (whether partial-read images or not), pixels outside of the partial-read image boundaries are left unchanged (raw DN). This insures that when partial-read images are processed, the zero-DN pixels added on to fill a full frame (768x768) will be left as zeroes, rather than being extrapolated meaninglessly to negative FN levels if they happen to fall within the low dispersion PHOTOM swath. With this change, all low dispersion images will have the corners of the photometrically corrected region truncated wherever the partial-read boundaries impinge upon the PHOTOM swath. This truncation, discussed further in the Newsletter article referenced above, does not affect the extracted spectral data.

MEANS OF IDENTIFYING AFFECTED DATA:

- Truncation of certain edges of the PHOTOM swath (as illustrated below schematically for the SWP case).



No. 92

TITLE: Perform photometric correction in low dispersion (under new software) in a non-optimally centered swath.

DATA AFFECTED:

CAMERA: ALL DISPERSION: Low PROCESSING: PI only

MEDIA: Tape, Photowrite

DATES: BEGIN 00:11 04 Nov. 1980 END 19:45 27 Aug. 1982 (GSFC)
17 Aug. 1981 (LWP)

BEGIN 16:00 10 Mar. 1981 END 19 Oct. 1982 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 7500

PERTINENT DOCUMENTATION: GSFC PPMR 322

DESCRIPTION: On the end dates shown, coincident with the change described by Configuration No. 91, the centering of the swath defining the primary constraint on the photometrically corrected area was optimized to lie more precisely between the large and small apertures. Prior to that time the swath had been miscentered by up to several pixels (without, however, affecting the extracted spectral data).

No. 93 X

TITLE: Utilize old echelle ripple correction in high dispersion.

DATA AFFECTED:

CAMERA: All DISPERSION: High PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp

DATES: BEGIN 03 Apr. 1978 END 19:45 27 Aug. 1982 (GSFC)
BEGIN 17 Apr. 1978 END 19 Oct. 1982 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 12000

PERTINENT DOCUMENTATION: GSFC PPMR 308; "IUE Data Reduction XXVIII," NASA IUE Newsletter No. 20, January 1983; "IUE Camera Sensitivities and the Echelle Ripple Correction," NASA IUE Newsletter No. 19, July 1982;" Configurations No. 6 and 17.

DESCRIPTION: Prior to the end dates listed, the echelle blaze ("ripple") correction was done according to the formula

$$F_{corr}(\lambda) = \frac{F(\lambda)}{R(\lambda)}$$

where $F_{corr}(\lambda)$ is the corrected flux, $F(\lambda)$ the uncorrected flux, and

$$R(\lambda) \equiv \frac{\sin^2 x}{x^2}(1+ax^2)$$

$$x = \frac{\pi m^2 (\lambda - \lambda_c)}{K}$$

$$\lambda_c = \frac{K}{m}$$

$$m = \text{order number},$$

and a and K are appropriately chosen constants (see Configurations No. 6 and 17).

As a result of the analysis done by T. Ake (Newsletter No. 19, alone), an improved ripple correction, of the form

$$\text{sinc}^2 m\pi\alpha (1-K/m/\lambda),$$

where K is allowed to be a second-order function of m, was adopted for production use on the end dates shown. K and α values used are listed below.

SWP, SWR	LWR, LWP
$K = 138827.0 - 27.43m + 0.1659m^2$	$K = 230012.0+17.25m - 0.0599m^2$
$\alpha = 0.856$	$\alpha = 0.896$

The constants were directly determined for SWP and LWR only and are also adopted for the SWR and LWP cases, respectively, until separate determinations can be made.

MEANS OF IDENTIFYING AFFECTED DATA:

- Old-form correction constants (K not a function of m) in processing - history label.

No. 94 X

TITLE: Use of non-optimal pixel offsets from small to large aperture in LWP.

DATA AFFECTED:

CAMERA: LWP DISPERSION: Both PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp

DATES: BEGIN 17 Aug. 81 END 17:20 21 Sept. 1982 (GSFC)
BEGIN 10 Mar. 82 END 19 Oct. 1982 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 50% (large-aperture only)

ESTIMATED NUMBER OF IMAGES AFFECTED: 200

PERTINENT DOCUMENTATION GSFC PPMR 326; "IUE Data Reduction XXXI," NASA IUE Newsletter No. 20, January 1983.

DESCRIPTION: Prior to the end dates specified, the small-to-large aperture offsets used to transplant the fundamental LWP small-aperture dispersion relations to the large aperture were mirror-reflections of the values used for the LWR camera. Although the spectral scale as seen by the two long-wavelength cameras is essentially the same, the orientation of the camera scan lines relative to the spectral orders is slightly different, which means that a mirror reflection of the LWR values is not optimal for LWP. The old and new offset values are tabulated below, in pixels.

	ΔL	ΔS	R
Old	+19.4	+18.6	26.9
New	+18.1	+19.9	26.9

$$R = [(\Delta L)^2 + (\Delta S)^2]^{1/2}$$

Assuming the new offsets correctly indicate the location of objects placed in the large aperture, the use of the old offsets introduced a wavelength error of -4.8 A in low dispersion and a velocity error of -1.0 km s^{-1} in high dispersion, for large aperture spectra.

No. 95 ✓

TITLE Use of March 1979 - January 1981 mean dispersion constants for LWR and SWP.

DATA AFFECTED:

CAMERA: LWR & SWP DISPERSION: Both PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 18:00 30 April 1981 (high) END 17:20 21 September 1982 (GSFC)
05:00 03 March 1981 (low)

BEGIN END (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 8,500

PERTINENT DOCUMENTATION: GSFC PPMRs 301, 302, 305, 309, 311, 319, 320,325, 326, 327; "IUE Data Reduction XXX" NASA IUE Newsletter No. 20, Jan. 1983; Minutes of the IUE Users Committee Meeting Sept. 27-28 1982, CSC/TM/6211. Configurations No. 67 and 72; "IUE Data Reduction XXXII" NASA IUE Newsletter No. 21, May 1983.

DESCRIPTION: The dispersion constants used during this time period represent an average of dispersion solutions obtained between March 1979 and January 1981. (See "IUE Data Reduction XXX" and Configurations number 72 and 67). These constants were replaced on the end dates above with a new mean set of dispersion constants based on 45 SWP high dispersion images, 44 SWP low dispersion images, 47 LWR high dispersion images and 46 LWR low dispersion images obtained between January 1980 and August 1982. It was felt that the larger data base including more recent calibration images represented a more appropriate set for determining mean dispersion constants and correlation coefficients. The new dispersion relations, including updated temperature and time corrections, also incorporate several improvements made to the procedures for calculating dispersion constants which are summarized below:

Date of Implementation	PPMR	Description
2/1/82	301	Temperature and time corrections were applied to the preliminary dispersion relation that are input to the program WAVECAL. These preliminary dispersion constants define the starting search locations used to identify the platinum emission lines.
2/5/82	302	The improved starting search locations described above allowed the use of smaller search areas (i.e., from 11 x 11 pixels to 7 x 7 pixels). The smaller search areas improved the cross-correlations used to identify line locations.
4/19/82	309-311	An LWR reseau which was commonly misidentified was removed from the file of "searched-for" reseaux. This modification has the effect of improving the geometric correction procedure which is applied to the wavelength calibration images.
7/26/82	319	The program FNDRES was modified to center more closely the cross-correlation matrix on the input reseau positions and to delete the central reseau area from the calculation of the mean background level. These changes improve the reseau-finding procedure.
7/26/82	320	The input parameters to the reseau-finding program FNDRES were modified to reduce the search area from 12 x 12 pixels to 7 x 7 pixels. As was the case in WAVECAL with finding the Pt-Ne emission lines, the smaller search area in FNDRES should improve the cross-correlations used to identify reseau positions and thereby improve the geometric correction procedure.
8/27/82	325	The search area described above was further reduced to 6 x 6 pixels (from 7 x 7 pixels) after an analysis of FNDRES showed that specifying an even number of pixels improved the centering of the correlation matrix on the input reseau positions.

The new dispersion constants are given below and should appear as shown in the header label of the extracted spectral files (aside from the A and B terms, which are subject to adjustment for thermal and registration shifts). The correlation coefficients shown for the temperature and time corrections are defined such that the mean time and temperature correspond to a correction of zero and are applied to the dispersion constants by adding a value W such that

$$W = W_1 + W_2T + W_3t$$

where

T = head amplifier temperature (THDA, in C°) and
t = number of days since January 1, 1978.

Updated Coefficients Defining the Dispersion Relations
for the Small Aperture (High Dispersion)

Dispersion Constants

	LWR HIGH	SWP HIGH
A_1	-4.877917909118001E-03	6.218892050975904E 02
A_2	1.472791022260271E-01	-1.723188694946298E-01
A_3	-5.522146305212622E-07	1.273046286227277E-06
A_4	7.449215787825510E-03	2.768587190334483E-02
A_5	2.767349997273978E-01	-4.654400112925802E-01
A_6	2.920103076528571E-09	-1.991352524783476E-07
A_7	1.110510384889110E-07	-1.311560455819058E-08
B_1	1.540903104020054E 04	-7.263344544922493E 03
B_2	-2.774574415612283E-01	-1.167948613338929E-01
B_3	9.077724306570848E-07	1.217348513144755E-06
B_4	5.925811878052170E-02	-8.673599101745499E-04
B_5	2.260993410233010E-01	3.988096737403947E-01
B_6	-8.019420360642425E-09	2.123655462298873E-08
B_7	4.017085561525235E-09	-1.725994284098098E-07

Correlation Coefficients

$W_1(S)$	5.279257774353027E 00	-2.243103027343750E 00
$W_2(S)$	-2.944609522819519E-01	2.709355205297470E-02
$W_3(S)$	-1.101587899029255E-03	1.696390565484762E-03
$W_1(L)$	-8.647566795349121E 00	-2.585970878601074E 00
$W_2(L)$	5.825527310371399E-01	2.170356512069702E-01
$W_3(L)$	6.621174979954958E-04	5.693519487977028E-04

Updated Coefficients Defining the Dispersion Relations
for the Small Aperture (Low Dispersion)

Dispersion Constants

	LWR LOW	SWP LOW
A_1	-2.990875719313456E 02	9.831253793383688E 02
A_2	3.022277020991960E-01	-4.664930974754992E-01
B_1	-2.644043768193267E 02	-2.633819950912196E 02
B_2	2.255967850073182E-01	3.762518274366946E-01

Correlation Coefficients

$W_1(S)$	5.347592353820801E 00	-2.239044189453125E 00
$W_2(S)$	-2.516177892684937E-01	1.984719652682543D-03
$W_3(S)$	-1.652141334488988E-03	1.870391191914678E-03
$W_1(L)$	-8.600588798522949E 00	-1.632983207702637E 00
$W_2(L)$	5.316009521484375E-01	1.545836925506592E-01
$W_3(L)$	1.222184859216213E-03	2.332759177079424E-04

MEANS OF IDENTIFYING AFFECTED DATA:

- The values for, and descriptions of, the dispersion constants, as given in the image label) will differ from those for the above mean constants (the A_1 and B_1 terms will normally vary from image to image).

No. 96 ✓

TITLE: Use of LWP dispersion constant files derived from single calibration images obtained on GMT day 168, 1981.

DATA AFFECTED:

CAMERA: LWP DISPERSION: Both PROCESSING: Extracted spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 17 August 1981 END 17:20 21 Sept. 1982 (GSFC)
BEGIN END (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 300

PERTINENT DOCUMENTATION: GSFC PPMRs 326, 327; "IUE Data Reduction XXX" NASA IUE Newsletter No. 20, Jan. 1983 (note errata in NASA IUE Newsletter No. 21, May 1983); "IUE Data Reduction XXXI" NASA IUE Newsletter No. 20, Jan. 1983; Configuration No. 95.

The LWP dispersion constants used during the above time period represent dispersion solutions obtained from single high and low dispersion calibration images (LWP 1220 low, LWP 1221 high). These constants were replaced on the end dates shown above with a new mean set of dispersion constants based on 14 LWP high and low dispersion images obtained between 17 June 1980 and 17 August 1982. The new dispersion relations (listed below in Table 1) incorporate several improvements to the procedures for calculating dispersion constants which are described in Configuration No. 95. Note that temperature and time corrections, which are implemented for the LWR and SWP cameras, have not been implemented for the LWP camera.

Table 1

Updated Coefficients Defining the Dispersion Relations
for the Small Aperture

	LWP High	LWP Low
A_1	7092.434	1045.484
B_1	-102.733	-272.238
A_2	18332.296E-5	-286.471E-3
B_2	-13694.831E-5	246.469E-3
A_3	6804.252E-10	
B_3	5902.048E-10	
A_4	1675.931E-2	
B_4	0.	
A_5	374.701E-3	
B_5	330.485E-3	
A_6	-721.526E-7	
B_6	180.210E-10	
A_7	-284.761E-8	
B_7	-36.529E-8	

No. 97

TITLE No optimal filtering for noise conditioning in LWP high dispersion processing.

DATA AFFECTED:

CAMERA: LWP DISPERSION: High PROCESSING: Extracted spectra

MEDIA: Tape, CalComp

DATES: BEGIN 14:18 10 Nov. 1981 END 13:30 11 Oct. 1982 (GSFC)
BEGIN 11 Mar. 1982 END 19 Oct. 1982 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 100

PERTINENT DOCUMENTATION: GSFC PPMR 328; "IUE Data Reduction XXV," NASA IUE Newsletter No. 18, March 1982; "IUE Data Reduction XXVIII", NASA IUE Newsletter No. 20, January 1983.

DESCRIPTION: The "optimal" noise-conditioning filter applied to the net ripple-corrected spectrum under the new reduction software was originally defined to be a unity filter in the case of the LWP camera. On the end dates shown, filter elements determined by F.H. Schiffer specifically for LWP spectra were put into LWP production use. These filter elements now condition the noise in the same way as is done for the LWR and SWP cameras. The old and new LWP filter weights used are listed below.

Element No.	Old	New
1	0	0.0017
2	0	0.0076
3	0	0.1027
4	1	0.7760
5	0	0.1027
6	0	0.0076
7	0	0.0017

No. 98 X

TITLE: No flagging of "bright spots".

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted spectra

MEDIA: Tape, CalComp

DATES: BEGIN 03 Apr. 1978 END 17:04 19 Nov. 1982 (GSFC)
BEGIN 17 Apr. 1978 END 19 Oct. 1982 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 30000

PERTINENT DOCUMENTATION: GSFC SOCARs 269, 270, 284; GSFC PPMRs 304, 329

DESCRIPTION: Prior to the end dates listed, standard production processing included no flagging of data affected by "bright-spot" artifacts in IUE images, i.e., discrete bright blemishes due either to permanent "hot pixels" or random radiation events. On the dates indicated, the program BSPOT was implemented to screen the raw images for bright-spot blemishes by searching for pixels with outlying DN values (i.e., pixels with values more than 90 DN above the typical local value) according to a specialized mean/median filtering routine. Pixels so located are catalogued in a file which is decoded by the extraction programs such that flux points with contributions from the affected pixels are flagged by the epsilon value - 300. The associated CalComp plots have such points plotted with the special symbol "◊".

No. 99

TITLE: Microphonics detection software run in "dummy" mode for SWP and LWP cameras.

DATA AFFECTED:

CAMERA: LWP, SWP DISPERSION: Both PROCESSING: Raw image

MEDIA: Tape, Photowrite

DATES: BEGIN 28 Sep. 1981 (low) END 6:03 31 Jan. 1983 (GSFC)
10 Nov. 1981 (high)

BEGIN N/A END N/A (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 4500

PERTINENT DOCUMENTATION: GSFC PPMR 332

DESCRIPTION: When the applications program MICRO was implemented to flag microphonic noise in LWR images (see Configuration No. 80), the SWP & LWP processing schemes at GSFC also included an execution of MICRO, even though MICRO was hardcoded to skip over the detection loop in the case of SWP or LWP. Thus, although the overall scheme structure was simplified by treating all cameras alike at the scheme level, execution time was wasted by MICRO's operation of reading the raw image file and then exiting in the case of SWP or LWP.

On the end date shown, the SWP and LWP schemes were modified to delete the call to MICRO. The only difference noticeable to the user is the lack of the MICRO execution tag in the image processing history label. Its presence under the old scheme configuration was potentially misleading since in fact no screening for microphonics was done for those cameras.

MEANS OF IDENTIFYING AFFECTED DATA:

- MICRO execution tag in history portion of image label.

No. 100 X

TITLE: Possible error in extracting correct head amplifier temperature from image header label.

DATA AFFECTED:

CAMERA: LWR & SWP DISPERSION: Both PROCESSING: SWP: all but raw image
LWR: extracted spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN Low: 03 Mar. 1981 END 16:00 24 Feb. 1983 (GSFC)
High: 19 May 1981

BEGIN END 31 May 1983 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: < 1 %

ESTIMATED NUMBER OF IMAGES AFFECTED: < 100

PERTINENT DOCUMENTATION: GSFC PPMR 333; "IUE Data Reduction XXI," NASA IUE Newsletter No. 15, Sep 1981.

DESCRIPTION: When the GMT date (i.e., day number) changed between the time an image was exposed and the time it was read, the applications program TCCAL would not obtain the correct head amplifier temperture (THDA) from the header label. As a result, the program would use mean dispersion constants rather than applying a temperature and time correction. For SWP, mean displacement files would be used rather than temperature corrected displacement files. On the end dates indicated, changes to TCCAL were implemented which allow the change in day number to be detected and handled properly.

MEANS OF IDENTIFYING AFFECTED DATA: If the read time in line 10 of post-1981 image header labels is close to 0 hours and the history portion of the header label shows mean dispersion constants and reseau positions were used, the above error was probably encountered.

No. 101 X

TITLE: Non-perpendicular manual registration shift.

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 17:20 21 Sept. 1982 END 16:00 24 Feb. 1983 (GSFC)
BEGIN END 31 May 1983 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 50%

ESTIMATED NUMBER OF IMAGES AFFECTED: 1100

PERTINENT DOCUMENTATION: GSFC PPMR 334

DESCRIPTION: The manual registration program, REG, contains values representing the approximate angles between the spectral orders and the direction in which the read beam moves. These angles are calculated using the mean dispersion constants (i.e., slope = $(dL/d\lambda)/(dS/d\lambda)$ and were not updated when the new dispersion constants were implemented on September 21, 1982. The old and new values are given below. In general, the differences are so small that little difference would be seen in the extracted spectral data.

Camera	Dispersion	Old angle(°)	Updated angle(°)
LWP	high	39.6	39.8
	low	310.69	310.7
LWR	high	324.25	324.1
	low	53.26	53.3
SWP	high	37.86	38.0
	low	308.88	308.9

No. 102 ✓

TITLE: Use of June 1980 - August 1982 mean LWP dispersion constants without a correction for temperature.

DATA AFFECTED:

CAMERA: LWP DISPERSION: Both PROCESSING: Extracted spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 17:20 21 Sept. 1982 END 16:12 12 April 1983 (GSFC)
BEGIN END 11 Oct. 1983 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 150

PERTINENT DOCUMENTATION: GSFC PPMRs 336, 335, 327; "IUE Data Reduction XXX" NASA IUE Newsletter No. 20 January 1983; Configuration No. 95, "IUE Data Reduction XXXII", NASA IUE Newsletter No. 21, May 1983.

DESCRIPTION: The June 1980 - August 1982 mean LWP dispersion constants were replaced on the end dates shown above with a new mean set of dispersion constants based on 28 high and low dispersion images obtained between June 1980 and March 1983. The expanded data base not only represented a more appropriate set for determining mean dispersion constants but also allowed the implementation of a correction for thermal shifts in location of the LWP spectral format.

The new constants and correlation coefficients are given below and should appear as shown in the header label of the extracted spectral files (aside from the $A_1 + B_1$ terms, which are subject to adjustment for thermal and registration shifts). The correction for temperature is applied by adding a value W where

$$W = W_1 + W_2T + W_3t$$

T = head amplifier temperature (THDA, in C°) and
t = number of days since January 1, 1978.

The correlation coefficients W above are defined such that the mean temperature corresponds to a correction of zero. Note that for the LWP camera the W_3 coefficients are set to zero, signifying that no correction for time is applied for this camera.

MEANS OF IDENTIFYING AFFECTED DATA:

- Values of, and descriptions for, the dispersion constants (given in image label) which differ from those for mean constants (aside from the A_1 and B_1 terms). The message "MEAN DC USED" also appears in the label when no temperature correction is applied.

Updated Coefficients Defining the LWP Dispersion Relations
for the Small Aperture (High Dispersion)

DISPERSION CONSTANTS

A1	6.519567430691839E 03
A2	-1.778483034226251E-01
A3	6.674819991848808E-07
A4	1.598582672397747E 01
A5	3.553799013108267E-01
A6	-6.882926804695988E-05
A7	-2.764837136203847E-06
B1	1.204170348210633E 03
B2	-1.481415791069993E-01
B3	6.141328065489587E-07
B4	3.920442560853582E-03
B5	3.214292514202579E-01
B6	4.968180685794447E-08
B7	-3.245305013106521E-07

CORRELATION COEFFICIENTS

W1(S)	-9.397546052932739E-01
W2(S)	1.034402847290039E-01
W3(S)	0.
W1(L)	-4.678806304931641E-00
W2(L)	5.145044326782227E-01
W3(L)	0.

Updated Coefficients Defining the LWP Dispersion Relations
for the Small Aperture (Low Dispersion)

DISPERSION CONSTANTS

A1	1.045978073509556E 03
A2	-2.866200015671855E-01
A3	0.
A4	0.
A5	0.
A6	0.
A7	0.
B1	-2.722438935715519E 02
B2	2.465021881612769E-01
B3	0.
B4	0.
B5	0.
B6	0.
B7	0.

CORRELATION COEFFICIENTS

W1(S)	-7.499701976776123E-01
W2(S)	8.839589357376099E-02
W3(S)	0.
W1(L)	-3.398871421813965E 00
W2(L)	4.001707434654236E-01
W3(L)	0.

No. 103 X

TITLE: Possible corruption of binary temperature data contained in image header label.

DATA AFFECTED:

CAMERA: All DISPERSION Both PROCESSING: All

MEDIA: Tape, CalComp

DATES: BEGIN 03 Apr. 1978 END 09 May 1983 (GSFC)
BEGIN END (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: << 1 %

ESTIMATED NUMBER OF IMAGES AFFECTED: << 350

PERTINENT DOCUMENTATION: GSFC PPMR 347.1 "IUE Data Reduction XIX", NASA IUE Newsletter No. 12, January 1981; NASA IUE Newsletter No. 17. February 1982; Configurations No. 67, 73, 102.

DESCRIPTION: The IUESIPS label modification utility program ULFLBM, used when an image label is corrupted and/or incomplete as archived by the OCC system, was found to delete unprintable characters from the label. This means that if the utility was used for modifying (or even displaying) label lines 40-100, the binary data (e.g. THDA data) contained therein was probably corrupted.

Images with binary label data corrupted in this way would be processed without any corrections applied for temperature or time (i.e., corrections would be defaulted to mean values).

NOTE: Images obtained before March 1979 were not considered to have reliable temperature data stored in the header label in any case, due to characteristics of the OCC software system (see "IUE Data Reduction XIX", NASA IUE Newsletter No. 12, January 1981).

MEANS OF IDENTIFYING AFFECTED DATA:

- In those cases where temperature corrections would otherwise have been made (see Configurations number 67, 73 and 102), the existence of the condition reported here would be flagged by an indication in the processing history portion of the label that "MEAN DC" had been used.

- Alternatively, the binary portion of the label can be directly inspected for corruption. For example, the data in label lines 86-100 as described on page A-30 of NASA IUE Newsletter No. 17 would be corrupted.

No. 104

TITLE Automatic registration without avoidance of multiple regions containing microphonic noise.

DATA AFFECTED:

CAMERA: LWR DISPERSION: Both PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 24 Nov. 1981 END 15:00 19 May 1983 (GSFC)
BEGIN END (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: <<< 1 %

ESTIMATED NUMBER OF IMAGES AFFECTED: $\lesssim$ 5

PERTINENT DOCUMENTATION: GSFC PPMR 340; NASA IUE Newsletter No. 18, March 1982; Configuration No. 85.

DESCRIPTION: As described in the Newsletter article mentioned above (see also Configuration number 85) the automatic registration program DCSHIFT was modified on November 24, 1981 to exclude from the registration shift calculation any spectral regions flagged as containing microphonic noise. It was assumed, however, that the microphonic noise for a particular image would only occur in one region, and therefore DCSHIFT was programmed to process only a single entry from the microphonics-flagging routine MICRO (specifically, the first entry written to the header label by MICRO). Since microphonics are now known occasionally to occur in more than one region (in a particular image) changes were made to DCSHIFT on the end date shown above allowing it to avoid up to 10 separate microphonics regions.

The effect of this error was to cause slightly less accurate registration shifts than would otherwise be used, although the self consistency checks built into the shift calculation would have eliminated large errors.

MEANS OF IDENTIFYING AFFECTED DATA: LWR images processed with automatic registration between the end dates shown and containing more than one label entry flagging microphonic noise, may be affected. The microphonic noise would have to occur in one of the spectral regions used by DCSHIFT for the registration calculation (see IUE Newsletter article).

No. 105 X

TITLE: Automatic registration without avoidance of any region containing microphonic noise.

DATA AFFECTED:

CAMERA: LWR DISPERSION: Both PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 3:50 31 Jan. 1983 END 15:00 19 May 1983 (GSFC)
BEGIN END (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: < 10%

ESTIMATED NUMBER OF IMAGES AFFECTED: < 60

PERTINENT DOCUMENTATION: GSFC PPMRs 332, 342; Configuration number 104.

DESCRIPTION: Independent of the changes in capability described in Configuration number 104, a modification to the IUESIPS scheme-generator software inadvertantly prevented DCSHIFT from obtaining microphonics flags output by the program MICRO. This means that LWR images processed between 31 Jan. 1983 and 19 May 1983 using the automatic registration procedure did not have regions containing microphonic noise excluded from the registration shift calculation.

The effect of this error was to cause slightly less accurate registration shifts then would otherwise be used, although the self-consistency checks built into the shift calculation would have eliminated large errors. The error was corrected on the end date shown above.

MEANS OF IDENTIFYING AFFECTED DATA:

- LWR images processed with automatic registration during the affected time period and containing a label entry flagging microphonic noise may be affected. The microphonic noise would have to occur in one of the spectral regions used by DCSHIFT for the registration calculation (see reference in Configuration number 104).

No. 106 X

TITLE Low dispersion background smoothing filter width of 30 data points.

DATA AFFECTED

CAMERA: All DISPERSION: Low PROCESSING: Extracted Spectra

MEDIA: CalComp, Tape

DATES: BEGIN 00:11 04 Nov. 1980 END 14:30 22 July 1983 (GSFC)
BEGIN 16:00 10 Mar. 1981 END 11 Oct. 1983 (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 5,000

PERTINENT DOCUMENTATION: GSFC PPMR 347; Configuration number 60.

DESCRIPTION: The low dispersion extraction routine POSTLO implemented on the start dates shown uses a double-pass mean filter for smoothing the low dispersion extracted background flux after a median filter is applied. (See Configuration number 60). The default filter width was documented as being 31 data points, although the program was actually coded to use 30 points. Changing the width to 31 on the end date shown resulted in a slight change to the net and the absolutely-calibrated net spectral fluxes stored in the MELO data file.

MEANS OF IDENTIFYING AFFECTED IMAGES:

- All low dispersion images processed during the time period shown will be affected.

No. 107 X

TITLE: Error in handling extracted LWR spectral data from images flagged as containing more than one region of microphonic noise.

DATA AFFECTED;

CAMERA: LWR DISPERSION: Both PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp, Photowrite

DATES:	BEGIN	14:28	28 Sept.	1981	(low)	END	12:35	21 July	1983	(low)
			10 Nov.	1981	(high)		19:46	25 July	1983	(high) (GSFC)
	BEGIN					END		27 Apr.	1984	(low)
								27 Apr.	1984	(high) (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: << 1%

ESTIMATED NUMBER OF IMAGES AFFECTED: < 5

PERTINENT DOCUMENTATION: GSFC PPMR's 339, 338

DESCRIPTION: The data extraction routines SPECLO and SPECHI were coded to handle only a single occurrence of microphonic noise in LWR spectral images. If the microphonics flagging program, MICRO, flagged more than one region as containing microphonic noise, the programs SPECLO and SPECHI would properly flag as contaminated (i.e., set the epsilon value equal to -220) only those spectral data extracted from the last region. Since the background flux calculation excludes data points flagged as containing microphonic noise, a slight error in the derived net and absolutely-calibrated net fluxes would occur as well.

MEANS OF IDENTIFYING AFFECTED IMAGES:

- LWR images with more than one region of microphonic noise identified in the header label and processed during the affected time period.

No. 108 X

TITLE: Incorrect observation date calculation when the GMT day number changes between the end of exposure and the time of read.

DATA AFFECTED

CAMERA: All DISPERSION: Both PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp

DATES:	BEGIN	SWP, 00:11	04 Nov. 1980 (low)	END 14:15 12 July 1983 (low)	
		& LWR:	10 Nov. 1981 (high)	15:45 27 July 1983 (high)	(GSFC)
		LWP:	17 Aug. 1981 (low)		
			07 Jan. 1982 (high)		
	BEGIN			END 27 Apr. 1984 (low)	
				27 Apr. 1984 (high)	(VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: << 5%

ESTIMATED NUMBER OF IMAGES AFFECTED: << 500

PERTINENT DOCUMENTATION GSFC PPMRs 344,345; Configuration number 100.

DESCRIPTION: When the GMT day number changes between the time an image exposure ends and the time it is read (as recorded in the image header label), the extraction routines POSTHI and SPECLO introduced an error of 24 hours in the observation date calculation. In low dispersion this error appeared in the header label and in the scale-factor record ("record 0") of the extracted spectral file where the midpoint of observation is recorded. Additionally, in high dispersion, an error would occur in the heliocentric velocity correction which is applied to the extracted spectral data on the basis of the calculated observation date.

MEANS OF IDENTIFYING AFFECTED IMAGES:

- If the read time in line 10 of the image header label is close to, but greater than, 0 hours and the GMT date in line 10 is the same as the observation date listed in the history portion of the header label, then the error may have occurred. The only way to be certain is to check the time entries in the event status portion of the header label and see if the end of exposure entry and the time of read entry differ numerically by ~24 hours.

No. 109 ✓

TITLE: No absolute calibration of LWP low dispersion fluxes.

DATA AFFECTED:

CAMERA: LWP DISPERSION: Low PROCESSING: Extracted Spectra

MEDIA: Tape, CalComp

DATES:	BEGIN	3 Apr. 1978	END	17:40 19 Oct. 1983	(GSFC)
	BEGIN		END	11 Oct. 1983	(VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 600

PERTINENT DOCUMENTATION: GSFC PPMR 352, ESA IUE Newsletter No. 17; NASA IUE Newsletter No. 23, Dec. 1983, p. 20.

DESCRIPTION: Prior to the end date shown above, no absolute calibration had been applied to LWP low dispersion net spectra. As of the end date, the LWP ABNET fluxes are calculated from the net fluxes using the absolute calibration for LWP presented in the Newsletter articles referenced.

No. 110 X

TITLE: No method for identifying modified image header label parameters.

DATA AFFECTED:

CAMERA: All DISPERSION: Both PROCESSING: All

MEDIA: Tape, CalComp, Photowrite

DATES: BEGIN 03 April 1978 END 18:35 19 Oct. 1983 (GSFC)
BEGIN END (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: < 1%

ESTIMATED NUMBER OF IMAGES AFFECTED: < 350

PERTINENT DOCUMENTATION: GSFC PPMR 350.

DESCRIPTION: Prior to the end dates shown, there existed no means of identifying situations in which certain image header label parameters needed by IUESIPS had been modified. The scheme LABINMOD, implemented on the end date, is an interim solution to the requirement for a means of replacing certain header label entries which are used by IUESIPS in those cases where those entries are in error or missing. Erroneous values are preserved as an audit record.

LABINMOD first creates an appendage to the header label which indicates which parameters have been modified and their original values. After those values are recorded, the parameter entries in the label are corrected in place.

Only certain label entries can be replaced by LABINMOD. They are: camera, image number, program identification, read time, right ascension, declination, and exposure time.

It is planned that LABINMOD will be replaced in the future by a scheme which will leave the bad label parameters as is and store the corrected values in an appendage patterned after the VILSPA data bank appendage.

No. 111 X

TITLE: Inaccurate message "MEAN DC USED" in label of temperature-corrected LWP images.

DATA AFFECTED:

CAMERA: LWP DISPERSION: Low PROCESSING: Extracted spectra

MEDIA: Tape, Photowrite

DATES: BEGIN 16:11 12 Apr. 1983 END 18:15 9 Nov. 1983 (GSFC)
BEGIN END (VILSPA)

ESTIMATED FRACTION OF PROCESSED IMAGES AFFECTED: 100%

ESTIMATED NUMBER OF IMAGES AFFECTED: 400

PERTINENT DOCUMENTATION: GSFC PPMR 351.

DESCRIPTION: Prior to this time period, no head amplifier temperature (THDA) correction was applied to the mean dispersion constants in the case of LWP images (See Configuration No. 102). During this period THDA corrections were made to LWP spectra, but their header labels incorrectly indicate that the mean dispersion constants (uncorrected) were used.

MEANS OF IDENTIFYING AFFECTED DATA:

- Affected images are in the range LWP 1844 - 2245.

SECTION 3 - LIMITATIONS AND WARNINGS

Every attempt has been made to provide correct and complete information in this document. The degree to which such efforts have succeeded is not uniform, depending on a number of circumstances, most of which relate to the state of the available records used as sources. The limitations imposed by such shortcomings are discussed below.

3.1 UNAVAILABLE DATA

A certain fraction of the relevant data for this documentation effort is not presently available. Most often, such data pertain to the configuration start and end dates. In some cases, the exact hour of implementation was not recorded and so only the GMT date is provided. In other cases, even the day of implementation is not presently known. In such instances, the date fields are left blank.

3.2 UNCERTAIN DATA

Some of the data required for the complete description of each configuration are uncertain. Such situations can arise when the available documentation sources are sketchy or imprecise or when the configuration is by nature too complicated for simple exposition in the format adopted here (an example would be the complete description of "special calibrations"--reseau-position and/or wavelength calibrations taken by the original Guest Observer for application to his own data).

In cases where dates are uncertain, exclamation marks are used to set them off. In cases where other specific information is uncertain, a "TBD" ("To Be Determined") entry is made. Some such entries might be resolved by further research with considerable additional effort; others may not be resolved at all. In general, the unresolved issues which are left because of conflicting or unclear data are of minor significance. Those areas in which there is known particular uncertainty include:

1) Background-smoothing program SMOOTH during the first two months of operation. There is ambiguity as to which program versions incorporating which changes were used in production during this time period. (See Configuration number 1).

2) Special calibrations (particularly prior to March 1981). The details of what effect special calibrations have on data are difficult to quantify because of the varying purposes for which the calibrations were obtained and the varying circumstances under which they were applied. For example, some high dispersion special calibrations were executed using reseaux found on high dispersion Pt-Ne images, even after July 1978 (see Configuration number 15) in order to satisfy the needs of the particular Guest Observer. It is also difficult to tell which images were reduced under special calibrations without an image-by-image check of processing logs, since prior to March 1981 no information identifying the calibration files used was put into the labels of images.

3) LWR ripple correction parameters in use at VILSPA prior to 14 June 1978. There is ambiguity as to the values of the K and A parameters used in production from 17 April 1978 to 14 June 1978. (See Configuration number 17).