The following table lists the most important of the modifications to the IUESIPS data reduction system which have had an effect on the output products delivered to the Guest Observer (G.O.). The changes made are listed in strict chronological order for GSFC and approximate chronological order for VILSPA. The table covers the period 5 April 1978 to 31 March 1983 and gives the effective dates at GSFC and VILSPA of each modification, along with a brief explanation of its nature. Those modifications that are not applicable to, or will not be made at, an installation are indicated by a dash in the date column. A date entry may be left blank for either of the following reasons:

(i)   the change has not been made, but may be made in the future;

(ii)   the modification concerns reduction of calibration images, which are not processed by VILSPA.

Modifications made only at VILSPA are grouped together at the end of the table.

This table replaces an earlier version published in NASA IUE Newsletter No. 15 (September 1981). A considerably more detailed history of IUESIPS changes affecting magnetic tape output was published as a separate document entitled "Techniques of Reduction of IUE Data: Time History of IUESIPS Configurations" in NASA IUE Newsletter No. 16. That document addressed changes through March 1981; an updated version is currently in preparation.

D.F. Stone

GSFC - VILSPA

Date	Modification
05 Apr 78 - 17 Apr 78	● Eliminate auto-scaling of net ripple-corrected CalComp plot (set $F_{MAX}=10^5$).
20 Apr 78 - 17 Apr 78	● Extend SWP low dispersion extraction to $\lambda=2000$ Å.
20 Apr 78 - 14 Jun 78	● Correct problem of corrupted data at ends of smoothed background spectra.
25 Apr 78 - 17 Apr 78	● Change F_{MAX} to 2×10^5 for net ripple-corrected plot.
26 Apr 78 - 14 Jun 78	● Correct problem in integer-scaling routine ITOE which caused certain large fluxes to be negative on tape due to rounding error.
04 May 78 - 14 Jun 78	● Add processing dates to CalComp plots.
08 May 78 - 14 Jun 78	● Eliminate "CUTMERGE" step from high dispersion processing.
10 May 78 - 14 Jun 78	● Eliminate plot of unsmoothed background in high dispersion.
11 May 78 - 14 Jun 78	● Limit ripple correction at ends of orders to factor of 15.8 in SWP and 17.2 in LWR.

Chronology of Modification to IUESIPS

Output Products

GSFC - VILSPA

Date	Modification
15 May 78 - 14 Jun 78	● Determine dispersion relations via new "WAVECAL2" (uses fractional pixel locations).
18 May 78 - 14 Jun 78	● Correct 1-pixel error in "OSCRIBE" overlay program.
22 May 78 - 14 Jun 78	● Use new averaged ITFs (contains SWP errors; see 7 July 1979).
22 May 78 - 14 Jun 78	● Use "EXTLOW" for low dispersion extraction instead of "COMPARE".
22 May 78 - 14 Jun 78	● Accomplish registration by shifting dispersion constants instead of image.
22 May 78 - 14 Jun 78	● Correct 2-pixel error in reseau flagging.
22 May 78 - 14 Jun 78	● Flag "saturated pixels" (DN=255) in plots, and change to plotting without lifting pen.
01 Jun 78 - 01 Feb 79	● Improve reseau flagging in smoothed spectra.
09 Jun 78 - 01 Feb 79	● Use reseaux measured on low dispersion image for both low and high dispersion wavelength calibrations (SWP).

Chronology of Modification to IUESIPS

Output Products

GSFC – VILSPA Date	Modification
16 Jun 78 - 25 Jan 79	● Delete 55-line image segment from photowrites (low dispersion).
20 Jun 78 - 25 Jan 79	● Produce one doubly-oscribed photowrite image for the double-aperture case, instead of 2 singly-oscribed images.
20 Jun 78 - 25 Jan 79	● Change LWR high dispersion oscribe overlay to pass through order 83 (Mg 2795, 2803).
01 Jul 78 - 01 Feb 79	● Use reseaux measured on low dispersion image for both low and high dispersion wavelength calibrations (LWR).
06 Jul 78 - 25 Jan 79	● Create all oscribes on "GEOM'D" images (not photometrically corrected images).
07 Jul 78 - 14 Jun 78	● Change LWR ripple parameters to K=231,150 A=0.09 instead of K=231,300 A=0.08. This changes the limiting ripple correction factor to 16.4.
01 Aug 78 - 14 Jun 78	● Create "extended source" reduction capability in low dispersion (HT=15, DIST=11).
04 Aug 78 - 7 Jul 82	● Change IUEPLOT to streamline x-axis and plot key to symbols used. (At VILSPA this change was made to NEWPLOT.)

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GSFC — VILSPA Date	Modification
08 Aug 78 - 01 Feb 79	● Correct bug in "ETOEM" to transmit image number to extracted spectrum files.
30 Aug 78 (low) ⎫ ⎬ 01 Feb 79 31 Aug 78 (high) ⎭	● Change standard LWR pixel offsets to transfer dispersion relations from small-to-large aperture as follows: $\Delta S=-17.5$ samples ⎫ replaces ⎧ $\Delta S=-21.1$ samples $\Delta L=+19.5$ lines ⎭ ⎩ $\Delta L=+25.1$ lines
17 Aug 78 - 01 Feb 79	● For "extended source" reduction, change min and max plotted fluxes for "log net" to 3.0 and 6.0 (replacing 2.0 and 5.0).
09 Sep 78 - 01 Feb 79	● Begin using automatic order-finding software (DSPCON), where possible, to determine spectral registration.
20 Sep 78 - _____	● Fix "ETOEM" to read only byte 50 (not 49 and 50) of first label record to obtain camera number for scale-factor record of extracted spectrum.
21 Sep 78 - 01 Feb 79	● Begin using improved low dispersion wavelength calibration line libraries.
25 Sep 78 - 01 Feb 79	● Move background location to "DIST=11" for low dispersion "point-source" reductions in large aperture (e.g., suppress geocoronal Lyα).

Chronology of Modification to IUESIPS
Output Products

GSFC - VILSPA Date	Modification
09 Nov 78 - _____	• 2 Å/inch high dispersion CalComp eliminated except by special authorization.
10 Dec 78 (low) 13 Dec 78 (high) } - 07 Mar 79	• Photometrically correct only a circular region of image ("FICOR5") in SWP high and low dispersion, LWR low dispersion.
13 Dec 78 - 25 Jan 79	• Change "EXTLOW" and DATEXTH2 to write line and sample shifts into label in auto registration case.
13 Dec 78 - 05 Jun 79	• Change "EXTLOW" to write "omega", "hback" and "distance" into the labels of extracted spectra.
19 Dec 78 - 14 Feb 79	• Eliminate processing of order 65 in SWP high dispersion.
04 Jan 79 - 07 Mar 79	• Photometrically correct only a circular region of image ("FICOR5") in LWR high dispersion (FICOR5 now used throughout).
30 Mar 79 - _____	• 10 Å/inch high dispersion CalComp eliminated in cases were 2 A/inch plot is authorized.
05 Apr 79 - 01 Feb 79	• Correctly enter line & sample shifts into label for the case of MANUAL registration.

GSFC   -   VILSPA

Date	Modification
05 Apr 79 - Sep 78	● Suppress excess label-plotting on CalComp plots.
30 Apr 79 -	● Begin writing raw image to tape for images designated "Do Not Process".
25 May 79 -	● Add plotter registration benchmark symbols at start and end of each plot.
02 Jun 79 - _____	● Add tape contents summary log at end of G.O. tape labelprints.
08 Jun 79 - 12 Jul 79	● Correct error in integer-scaling routine ("ITOE") for extracted-spectrum files, so that all negative fluxes are converted properly. (See NASA IUE Newsletter No. 7).
15 Jun 79 - 10 Jan 80	● Create "extended source" reduction capability in high dispersion (HT=7).
19 Jun 79 -	● Eliminate redundant tape files in the case of calibration-image reduction.

GSFC   -   VILSPA

Date	Modification
30 Jun 79 - 01 Feb 80	● Begin plotting high dispersion net ripple-corrected spectra with "CUTMERGE" to suppress noise at ends of orders and allow auto-scaling of flux axis (applies ONLY to CalComp plots; G.O. tapes unchanged).
02 Jul 79 - _____	● Begin writing identifying header file on G.O. tapes (for data management accounting purposes).
07 Jul 79 - 07 Aug 79	● Correct error in SWP ITF.
08 Jul 79 - 10 Mar 81	● Change ΔS and ΔL pixel offsets for large aperture dispersion relations to correspond to actual object placement point. (See NASA IUE NEWSLETTER No. 6.)
27 Jul 79 - _____	● Begin use of new CalComp plotter hardware. Plots are more precise and on wider paper, but still 10-inch full scale grid.
06 Aug 79 - 10 Mar 81	● Change ΔS and ΔL pixel offsets for large aperture dispersion relations to correspond to physical center of large aperture. (In coordination with telescope operations change, so that offsets still correspond to object

GSFC   -   VILSPA

Date	Modification
	placement. Change refers to all data acquired as of 1 August 1979. (See NASA IUE NEWSLETTER No. 6).
28 Sep 79 - 01 Feb 80	● Modify the program "OSCRIBE" to generate overlay more efficiently and suppress overlay entirely outside of tube face. (See 11 Nov 79 entry).
08 Oct 79 - _____	● Begin producing computer-generated GO data product receipts.
11 Oct 79 - _____	● Upgrade tape contents summary log at end of GO tape labelprints to include additional information.
30 Oct 79 - _____	● Begin use of mean dispersion constants for low dispersion spectra. (See NASA IUE NEWSLETTER No. 7).
11 Nov 79 - 01 Feb 80	● Correct problem in version of OSCRIBE implemented 28 Sept 79 in order to place overlay over entire image for large aperture spectra.
23 Nov 79 - 10 Mar 81	● Begin using improved high dispersion wavelength calibration line libraries.

GSFC — VILSPA

Date	Modification
08 Jan 80 - 01 Sep 78	• Eliminate 10 $\overset{o}{A}$/inch plot of net ripple corrected spectrum in high dispersion and make 2 $\overset{o}{A}$/inch plot of same the standard.
08 Jan 80 - 01 Feb 80	• Begin using FICOR6 photometric correction program which extrapolates the ITF at or near the upper limit. (See NASA IUE NEWSLETTER No. 8).
08 Jan 80 -	• Change symbol key on CalComp plots to allow "+" to mean either "saturated, or limited extrapolation".
09 Jan 80 - 02 Apr 80	• Begin producing absolutely calibrated net spectra in low dispersion (See NASA IUE NEWSLETTER No. 8), using LWR calibration revised at 1900 $\overset{o}{A}$.
01 Mar 80 - 06 Mar 80	• Begin using EXTLOW2 to place background extraction further from center of order by a factor of $\sqrt{2}$. (See NASA IUE NEWSLETTER No. 9).
18 Apr 80 - _____	• Begin using further improved high dispersion wavelength calibration line libraries.

GSFC   -   VILSPA

Date	Modification
22 Apr 80 –	• Begin using improved cross-correlation template for large reseau in FNDRES and add 2 more reseaux in LWR and 3 more reseaux in SWP.
31 May 80 –	• Begin finding reseaux on TFLOOD images instead of low dispersion platinum-plus-TFLOOD images.
18 Jul 80 – 10 Mar 81	• Begin use of mean reseau sets and mean high and low dispersion constants. (See NASA IUE NEWSLETTER No. 11).
18 Aug 80 – 30 Dec 80	• Correct two minor errors in automatic registration programs DSPCON and DCSHIFT: properly convert integer pixel values to real values, and properly generate a perpendicular shift.
28 Aug 80 –	• Begin use of mean positions of lines to start preliminary wavelength solutions.
28 Aug 80 – _____	• Correct the OSCRIBE problem for large aperture spectra (See 11 Nov. 79 entry) which inadvertantly infiltrated

GSFC - VILSPA

Date	Modification
	production system on 30 Jul 80 when program was recompiled for system reasons.
29 Aug 80 -	• Begin using final improved versions of high dispersion wavelength calibration line libraries.
18 Sep 80 - 30 Sep 80	• Change program ETOEM to correctly write 5-digit image sequence numbers in scale-factor record ("record zero") of extracted spectra.
04 Nov 80 - 10 Mar 81	• Begin use of new low dispersion software (See NASA IUE NEWSLETTER No. 12).
04 Nov 80 -	• Modify manual registration program REGISTER (new name = REG) to calculate shifts which are exactly perpendicular to the dispersion from operator inputs.
04 Nov 80 - 10 Mar 81	• Flag shifts as either "manual" or "auto" in image headers in new low dispersion software.

GSFC   -   VILSPA

Date	Modification
04 Nov 80 - _____	● Change labelprinting program to use new low-dispersion file nomenclature; use "PI" instead of "GPI" even for <u>high dispersion</u> photometrically corrected image (still old software).
04 Nov 80 - 10 Mar 81	● Put scheme name in output file labels in high and low dispersion.
04 Nov 80 - 30 Jan 81	● Flag shifts as either "manual" or "auto" in image headers in current <u>high dispersion</u> software.
26 Nov 80 - _____	● Correct an error in the registration program REG so that shifts for the SWP camera will be perpendicular to the dispersion.
22 Dec 80 - _____	● Modify program VBBLK so that the values of starting sample and starting line in the RAW image label will be 001 and 001 instead of 895 and 895. This change only affects tapes sent to the National Space Science Data Center (NSSDC).

GSFC   -   VILSPA

Date	Modification
16 Jan 81 - 17 Jun 81	● Modify program SPECLO to put the correct declination of southern objects in the output label, and to output correct line and sample shift information.
19 Jan 81 - 17 Jun 81	● Correct small registration error (~0.4 pixels) for SWP-HIGH, LWR-LOW and all trailed images.
03 Mar 81 - 11 Mar 82	● Use temperature correction algorithm and new mean dispersion constants for LOW dispersion calibration files. Modify labels to reflect this change.
03 Mar 81 - 17 Jun 81	● Begin use of an improved center and radius in PHOTOM defining region of photometric correction for LOW dispersion processing. The new radius is smaller than the preliminary one and was chosen to accommodate eventual high dispersion processing.
05 Mar 81 - 17 Jun 81	● Modify the LOW dispersion program SPECLO to test the quality of each pixel for photometric correction before using in an extracted flux computation.
06 Mar 81 - 5 May 81	● Modify LOW dispersion program POSTLO so that it blank-fills unused portions of the IUESIPS label of extracted spectra.

Chronology of Modification to IUESIPS

Output Products

GSFC - VILSPA Date	Modification
22 Apr 81 -	● Correct program TRACE to place wavelength overlay over entire image for large aperture spectra.
30 Apr 81 - 17 Apr 80	● Replace program 'CUTMERGE' by program 'CORTAME', which only cuts bad data from orders and leaves some order overlap on plots (SWP and LWR cameras only at this time).
6 May 81 - 7 Jul 82	● Add new DN step wedge on photowrite prints.
19 May 81 - 11 Mar 82	● Implement temperature/time correction of displacement files and dispersion constants in high dispersion.
11 Jun 81 - 30 Dec 80	● Use program ESMOOTH for background smoothing in high dispersion. Implements a median-plus-mean smoothing similar to new low dispersion S/W.

Chronology of Modification to IUESIPS
Output Products

GSFC - VILSPA Date	Modification
11 Jun 81 -	• Begin labeling gray scales on photowrites (see 6 May 81 change) with corresponding DN values.
17 Jun 81 -	•. Implement automatic flux scaling of LOG ABNET plots in low dispersion.
22 Jun 81 -	• Suppress flagging of contaminated points on CalComp plots of the smoothed background in low dispersion.
10 Jul 81 -	• Implement new ITF extrapolation algorithm in photometric correction program PHOTOM ("new" software only). See NASA IUE Newsletter No. 15.
24 Jul 81 -	• Correct center and radius value in photometric correction program PHOTOM back to the values of 3 Mar 81 which were inadvertantly changed with 10 Jul 81 modification of PHOTOM.
30 Jul 81 - 10 Mar 81	• Begin producing 2-color CalComp plots.
10 Aug 81 -	• Implement new SOC photowrite transfer function to reduce contrast at low DN levels and increase contrast at high DN levels.

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Chronology of Modification to IUESIPS

Output Products

GSFC - - VILSPA Date	Modification
17 Aug 81 - 10 Mar 81	● Implement schemes and software for processing LWP camera images in both high and low dispersion.
25 Aug 81 - 11 Oct 79	● Provide an option to ignore Geocoronal Lyman α in scaling SWP low dispersion GROSS and ABNET plots.
28 Aug 81 - 11 Mar 82	● Modify method of automatic registration of high dispersion images so as to measure the shift at the closely-spaced orders.
28 Aug 81 - 12 Jul 79	● Begin producing bar-type CalComp plots in low dispersion.
28 Sep 81 - 11 Mar 82	● Implement flagging of LWR camera microphonics noise on tape and CalComp plots, low dispersion only at this time.

| GSFC   -   VILSPA | |
Date	Modification
5 Oct 81 - 12 Jul 79	● Begin producing bar-type CalComp plots in high dispersion
19 Oct 81 -	● Implement new transfer function for photowrite contact prints to match the effective response achieved for SOC (quick look) photowrites. (See 10 Aug 81 change and <u>NASA IUE Newsletter</u> No. 18.)
3 Nov 81 -	● Modify automatic registration program under new software (DCSHIFT) so as to improve the registration of trailed images, ignore areas of image affected by microphonic noise, and allow larger shifts.
3 Nov 81 -	● Begin using LWP ITF1 which differs from previously used ITF0 in changing effective exposure time for second level from 20.22 seconds to 23.00 seconds.
10 Nov 81 - 11 Mar 82	● Begin use of new high dispersion software for SWP and LWR. (See <u>NASA IUE Newsletter</u> No. 18).
10 Nov 81 - 11 Mar 82	● Implement flagging of LWR camera microphonics noise on tape and CalComp plots for high dispersion (implemented 28 Sep 81 for low dispersion)

GSFC - VILSPA Date	Modification
10 Nov 81 -	● Make CalComp plots an optional data product (previously created automatically).
10 Nov 81 - 10 Mar 81	● Install option to ignore Geocoronal Lyman α in scaling SWP high dispersion plots.
13 Nov 81 - 11 Mar 82	● Modify automatic registration software (DCSHIFT) to improve shift for trailed images.
16 Nov 81 - 11 Mar 82	● Correct minor roundoff error in writing dispersion constants into scale factor record of the low dispersion extracted spectrum files (MELO and LBLS).
23 Nov 81 - _____	● Add to label of found reseau position file the camera and image sequence number of the image from which the positions were derived.
24 Nov 81 - 11 Mar 82	● Further modify automatic registration software (DCSHIFT) to allow more trailed images to be treated automatically. (See NASA IUE Newsletter No. 18).
7 Jan 82 - 11 Mar 82	● Begin use of new high dispersion software for LWP.
27 Jan 82 - 11 Mar 82	● Modify TRACE to limit wavelength grid overlay to area defined by center and radius used for photometric correction in high dispersion.

GSFC - VILSPA

Date	Modification
1 Feb 82 -	• Alter details of calculating preliminary dispersion solution for WAVECAL images so as to account for temperature/time effects. Little impact on final WAVECAL solutions expected.
8 Feb 82 -	• Begin using smaller cross-correlation search area in finding emission lines on WAVECAL images. This change is made possible by the change of 1 Feb, but also has little expected impact on final solutions.
16 Feb 82 -	• Reduce volume of printed output for flat-field BOXSTATS processing.
3 Mar 82 - 10 Mar 81	• Install VILSPA partial read program INSERT. (At VILSPA install as part of all low dispersion schemes.)
5 Mar 82 -	• Modify the utility tape input program ULTPIN to zero fill lines which have unrecoverable read errors.
29 Apr 82 -	• Correct program VBBLK so that it no longer adds an extraneous L in the next to the last line of the image header.
5 May 82 - 7 Jul 82	• Correct program POSTHI to consistently include spectral order 72 for high dispersion LWR images.

GSFC - VILSPA

Date	Modification
5 May 82 - 7 Jul 82	● Correct program POSTHI to use the event status entry from line 10 in searching for the end of exposure time for use in the heliocentric correction.
6 May 82 - 7 Jul 82	● Correct program SPECLO to use the event status entry from line 10 in searching for the end of exposure time.
5 Aug 82 - 19 Oct 82	● Correct the method in program POSTHI for handling negative declination values.
5 Aug 82 - 16 Jul 82	● Correct program POSTHI to scale the ripple corrected net spectral data according to the appropriate minimum and maximum flux values.
27 Aug 82 - 19 Oct 82	● Modify program PHOTOM to photometrically correct only the area inside the partial read boundaries for all low dispersion images.
27 Aug 82 - 19 Oct 82	● Modify program PHOTOM to improve the centering of the swath which is photometrically corrected for low dispersion images.
27 Aug 82 - 19 Oct 82	● Implement the new ripple correction algorithm as defined by T. Ake (see NASA IUE Newsletter No. 19).

GSFC - VILSPA

Date	Modification
02 Sep 82 - 19 Oct 82	● Modify INSERT to make defaults for partial-read parameters agree with those used by operations.
21 Sep 82 - 19 Oct 82	● Modify LWP large aperture offsets in TCCAL and master calibration schemes.
21 Sep 82 - 19 Oct 82	● Implement new mean dispersion constants for LWP, LWR, and SWP using data from 1/1/80 to 8/29/82. Implement new temperature and time correlation coefficients for LWR and SWP.
11 Oct 82 - 19 Oct 82	● Modify POSTHI to use the 7-point "optimal" filter for LWP high dispersion images.
19 Nov 82 - 19 Oct 82	● Implement BSPOT using flagging mode only.
19 Nov 82 - 10 Apr 81	● Modify NEWPLOT to flag bright spots as detected by BSPOT.
24 Feb 83 -	● Modify TCCAL to extract the correct head amplifier temperature from the image header when the GMT date changes between the time an image is exposed and the time it is read.
24 Feb 83 -	● Update the angles of the spectral orders, as specified in the program REG, to correspond with the recently implemented dispersion relations.

GSFC – VILSPA Date	Modification
– 17 Apr 78	● LWR ripple parameters K=231 075 and A=0.09 used.
– 06 Jul 78	● Change high dispersion CalComp from 2 $\overset{o}{A}$/inch to 1 $\overset{o}{A}$/cm.
– 12 Jul 79	● Begin producing absolutely calibrated net spectra in low dispersion (using original A & A calibration).
– 16 Nov 79	● Correct error in printer output from "EXTLOW" so gross-background given with correct sign.
– 10 Jan 80	● Write camera, image and aperture identifier on all plots. (This information has always been present on GSFC plots.)
– 28 Feb 80	● Produce plots on narrow paper as standard, wide paper available by special request.
– 10 Mar 81	● Modify and standardize format of labels inserted during processing.

GSFC   - VILSPA

Date	Modification
_____ - 10 Mar 81	● Revise plotting program to improve plot layout and appearance. Box drawn around plot area, tick marks placed inside box, all data now plotted inside box, titling information repositioned and object catalog designation added, alternate high dispersion orders plotted in contrasting colors. (See 30 Jul 81 GSFC.)