

IUE Orbital Elements II

This report extends the previous compendium of IUE orbital elements (Ehlers 1981) to April 1984. These elements can be used to derive radial velocity corrections as discussed by Jenkins (1979), Harvel (1980), and Schiffer (1982).

Table 1 is the list of orbital elements. Each epoch is given as year, month, and day in the format YYMMDD. The epoch is always at 00:00 GMT. The inclination, longitude of ascending node, argument of perigee, and mean anomaly are given in degrees. The semi-major axis is given in kilometers. The orbital period can be found from the equation

$$P = 1.6586 \times 10^{-4} a^{3/2} \text{ minutes.}$$

The orbit of IUE is continually changing due to anomalies in the earth's gravitational field which accelerate the spacecraft westward. For this reason the orbital elements also change and so are updated frequently. In addition, the satellite must be kept within the field of view of the receiving antennae, both at Goddard Space Flight Center and at Villa Franca, Spain. When the spacecraft drifts too far west, the orbit is corrected using the hydrazine jets. This corrective maneuver (a "delta V") causes the spacecraft drift to reverse direction and drift eastward. The changes in the drift direction represent discontinuities in the orbital elements, particularly the semi-major axis. Breaks in Table 1 indicate such discontinuities due to a delta V. Table 2 lists the dates (format YYMMDD) and GMT times at which the corrective maneuvers were performed. When deriving radial velocity corrections, caution should be used in interpolating values near the times of these discontinuities in order to ensure accurate results. The time changes in Table 2 from Ehlers (1981) resulted from a small uncertainty in the recordkeeping.

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1984 May 18

References

- Ehlers, R. 1981, NASA IUE Newsletter, No. 14, p. 100.
- Jenkins, E.B. 1979, NASA IUE Newsletter, No. 5, p. 23.
- Harvel, C. 1980, NASA IUE Newsletter, No. 10, p. 32.
- Schiffer, F.H., III. 1982, Data Analysis Procedures for the IUE RDAF (Part I), p. 3-8.

Table 1

IUE Orbital Elements

<u>Epoch</u>	<u>Semi-Major Axis</u>	<u>Eccentricity</u>	<u>Inclination</u>	<u>Ascending Node</u>	<u>Arg of Perigee</u>	<u>Mean Anomaly</u>
780222	42168.0	0.2395473	028.639	207.566	257.648	342.655
780301	42168.7	0.2392656	028.641	207.441	257.220	349.342
780308	42168.9	0.2391520	028.648	207.260	257.928	355.910
780315	42169.3	0.2390043	028.655	207.144	257.960	002.513
780322	42170.0	0.2389189	028.652	206.984	258.167	008.944
780329	42170.7	0.2388213	028.653	206.886	258.159	015.456
780405	42171.8	0.2387689	028.651	206.703	258.360	021.820
780412	42171.5	0.2388617	028.651	206.591	258.393	028.212
780419	42173.8	0.2388630	028.635	206.455	258.573	034.444
780426	42173.1	0.2390331	028.626	206.332	258.596	040.742
780503	42175.2	0.2390400	028.612	206.168	258.781	046.905
780510	42174.6	0.2393258	028.600	206.035	258.825	053.091
780517	42176.0	0.2393832	028.588	205.902	259.049	059.111
780524	42175.9	0.2397106	028.564	205.783	259.104	056.211
780531	42177.1	0.2396866	028.560	205.591	259.325	071.167
780607	42176.8	0.2400471	028.530	205.475	259.433	077.124
780613	42177.1	0.2400538	028.527	205.324	259.657	082.112
780620	42177.2	0.2402467	028.515	205.252	259.816	087.939
780627	42177.4	0.2402030	028.504	204.944	260.056	093.742
780725	42151.9	0.2396312	028.483	204.298	260.813	116.560
780803	42152.8	0.2396814	028.472	204.134	261.062	126.799
780810	42152.7	0.2393209	028.489	203.970	261.247	134.727
780817	42153.1	0.2393500	028.475	203.786	261.436	142.646
780824	42153.9	0.2389324	028.487	203.629	261.554	150.528
780831	42154.5	0.2389063	028.496	203.437	261.753	158.330
780914	42155.5	0.2384953	028.496	203.172	262.033	173.847
780921	42155.3	0.2381839	028.504	203.050	262.097	181.562
780928	42157.2	0.2381510	028.517	202.849	262.242	189.188
781005	42155.7	0.2379313	028.521	202.787	262.373	196.790
781012	42158.4	0.2379517	028.514	202.631	262.472	204.336
781019	42157.1	0.2378601	028.514	202.571	262.554	211.849

Table 1 (continued)

IUE Orbital Elements

<u>Epoch</u>	<u>Semi-Major Axis</u>	<u>Eccentricity</u>	<u>Inclination</u>	<u>Ascending Node</u>	<u>Arg of Perigee</u>	<u>Mean Anomaly</u>
781026	42159.6	0.2379101	028.480	202.370	262.674	219.273
781102	42158.3	0.2379695	028.499	202.188	262.728	226.695
781109	42161.1	0.2380262	028.486	202.130	262.894	234.039
781116	42160.0	0.2381961	028.466	202.000	262.934	241.362
781123	42162.4	0.2382739	028.448	201.831	263.142	248.544
781130	42161.6	0.2384876	028.431	201.696	263.223	255.748
781207	42164.2	0.2385020	028.405	201.472	263.472	262.852
781214	42163.1	0.2387844	028.389	201.316	263.569	269.924
781221	42165.2	0.2387389	028.390	210.192	263.803	276.858
790104	42167.5	0.2387801	028.382	200.852	264.143	290.707
790111	42166.8	0.2389980	028.362	200.579	264.301	297.566
790118	42167.8	0.2387210	028.369	200.495	264.584	304.276
790125	42168.7	0.2388393	028.364	200.385	264.673	311.040
790201	42169.0	0.2384144	028.372	200.160	264.956	317.711
790208	42169.1	0.2385111	028.353	200.058	265.114	324.340
790215	42169.6	0.2380755	028.383	199.851	265.339	330.881
790222	42170.5	0.2381567	028.379	199.759	265.437	337.433
790301	42170.0	0.2376248	028.402	199.548	265.596	343.922
790308	42171.1	0.2377645	028.395	199.418	265.736	350.354
790315	42170.9	0.2372990	028.409	199.290	265.876	356.711
790322	42172.4	0.2374896	028.403	199.168	265.944	003.073
790329	42171.8	0.2370599	028.414	198.955	266.070	009.391
790405	42173.1	0.2373532	028.400	198.846	266.150	015.611
790412	42173.8	0.2370299	028.412	198.746	266.281	021.788
790419	42174.9	0.2373967	028.388	198.597	266.373	027.951
790426	42175.9	0.2371330	028.394	198.454	266.422	034.070
790503	42176.4	0.2375415	028.368	198.327	266.585	040.079
790510	42177.1	0.2373966	028.371	198.199	266.705	046.068
790517	42177.0	0.2378410	028.347	198.043	266.864	052.026
790524	42178.0	0.2376979	028.340	197.865	266.963	057.969

Table 1 (continued)

IUE Orbital Elements

<u>Epoch</u>	<u>Semi-Major Axis</u>	<u>Eccentricity</u>	<u>Inclination</u>	<u>Ascending Node</u>	<u>Arg of Perigee</u>	<u>Mean Anomaly</u>
790531	42177.3	0.2380957	028.317	197.700	267.165	063.795
790607	42179.0	0.2380043	028.323	197.594	267.324	069.608
790614	42179.8	0.2382941	028.258	197.904	267.697	075.273
790621	42154.3	0.2377629	028.291	197.235	267.637	081.244
790629	42152.9	0.2379556	028.288	197.052	267.951	090.280
790706	42155.1	0.2378887	028.280	196.903	268.075	098.214
790713	42153.2	0.2379262	028.287	196.707	268.353	106.076
790718	42155.3	0.2377404	028.282	196.578	268.425	111.705
790727	42153.7	0.2377012	028.295	196.412	268.782	121.664
790803	42156.0	0.2375410	028.288	196.245	268.877	129.440
790810	42154.2	0.2373446	028.299	196.060	269.118	137.141
790816	42156.7	0.2371688	028.300	195.929	269.203	143.747
790823	42155.6	0.2369590	028.314	195.761	269.448	151.331
790906	42156.1	0.2365011	028.331	195.463	269.738	166.490
790913	42158.2	0.2363013	028.324	195.328	269.795	174.024
790920	42157.8	0.2360332	028.342	195.155	269.967	181.456
790927	42158.5	0.2359336	028.338	195.078	270.038	188.885
791004	42158.9	0.2357176	028.345	194.897	270.181	196.270
791011	42160.2	0.2357182	028.331	194.799	270.231	203.611
791018	42160.7	0.2355197	028.340	194.653	270.384	210.863
791025	42160.8	0.2356650	028.321	194.529	270.438	218.124
791115	42163.7	0.2356312	028.296	194.130	270.814	239.510
791122	42163.2	0.2359693	028.273	193.962	270.913	246.560
791129	42165.6	0.2358468	028.277	193.767	271.067	253.553
791206	42164.8	0.2361983	028.247	193.648	271.225	260.454
791213	42166.7	0.2360669	028.257	193.456	271.411	267.313
791220	42166.0	0.2363979	028.234	193.295	271.562	274.142
800103	42167.4	0.2364190	028.221	192.961	271.980	287.609
800110	42169.2	0.2361310	028.238	192.805	272.171	294.264
800117	42168.7	0.2363326	028.229	192.622	272.370	300.884

Table 1 (continued)

IUE Orbital Elements

<u>Epoch</u>	<u>Semi-Major Axis</u>	<u>Eccentricity</u>	<u>Inclination</u>	<u>Ascending Node</u>	<u>Arg of Perigee</u>	<u>Mean Anomaly</u>
800124	42170.9	0.2359093	028.251	192.434	272.522	307.477
800131	42169.9	0.2360137	028.248	192.268	272.763	313.945
800207	42171.3	0.2355873	028.270	192.145	272.911	320.409
800214	42151.6	0.2352898	028.262	191.978	273.116	327.054
800228	42152.4	0.2347928	028.293	191.667	273.411	343.250
800306	42152.6	0.2343690	028.304	191.549	273.503	351.301
800313	42153.9	0.2344326	028.299	191.396	273.648	359.283
800320	42153.7	0.2340191	028.312	191.268	273.707	007.268
800327	42155.5	0.2340853	028.314	191.110	273.870	015.107
800403	42155.5	0.2338467	028.312	191.017	273.930	022.976
800410	42157.3	0.2340265	028.301	190.867	274.065	030.759
800424	42158.6	0.2339765	028.292	190.575	274.322	046.184
800501	42158.9	0.2339681	028.287	190.481	274.342	053.847
800508	42159.5	0.2341761	028.266	190.319	274.520	061.405
800515	42160.0	0.2341846	028.261	190.207	274.564	068.967
800522	42160.3	0.2343342	028.255	190.025	274.812	076.368
800529	42161.4	0.2344403	028.239	189.895	274.900	083.796
800605	42160.6	0.2346075	028.234	189.683	275.133	091.122
800613	42161.9	0.2347554	028.215	189.500	275.277	099.475
800619	42161.3	0.2347040	028.227	189.354	275.511	105.603
800625	42165.8	0.2347760	028.217	189.244	275.604	111.755
800703	42164.4	0.2347936	028.225	189.015	275.887	119.613
800717	42165.4	0.2346093	028.234	188.696	276.284	133.184
800724	42167.7	0.2345723	028.233	188.548	276.431	139.913
800731	42165.9	0.2343032	028.253	188.361	276.666	146.559
800807	42168.7	0.2342317	028.248	188.212	276.801	153.181
800815	42167.5	0.2338159	028.280	188.050	277.022	160.630
800822	42169.9	0.2337357	028.278	187.884	277.167	167.142
800829	42168.3	0.2332867	028.299	187.720	277.322	173.590
800905	42170.9	0.2332170	028.298	187.574	277.480	179.977

Table 1 (continued)

IUE Orbital Elements

<u>Epoch</u>	<u>Semi-Major Axis</u>	<u>Eccentricity</u>	<u>Inclination</u>	<u>Ascending Node</u>	<u>Arg of Perigee</u>	<u>Mean Anomaly</u>
800912	42170.0	0.2327891	028.307	187.466	277.591	186.296
800919	42172.2	0.2327463	028.302	187.308	277.707	192.606
800926	42170.7	0.2323634	028.328	187.178	277.786	198.867
801003	42173.6	0.2323506	028.307	187.035	277.943	205.034
801009	42172.8	0.2320975	028.321	186.948	277.998	210.300
801016	42174.3	0.2321704	028.321	186.866	278.083	216.401
801023	42173.9	0.2319303	028.305	186.680	278.177	222.472
801030	42176.2	0.2321272	028.292	186.520	278.305	228.441
801106	42175.9	0.2319964	028.292	186.403	278.394	234.379
801113	42176.9	0.2322767	028.276	186.305	278.526	240.247
801120	42177.2	0.2321134	028.274	186.087	278.628	246.111
801127	42178.8	0.2323635	028.252	185.933	278.842	251.832
801217	42153.3	0.2318607	028.243	185.471	279.253	268.300
801225	42153.4	0.2320597	028.242	185.248	279.536	277.442
810101	42154.3	0.2319507	028.237	185.131	279.668	285.435
810106	42153.9	0.2320993	028.241	184.983	279.827	291.098
810120	42155.0	0.2318612	028.259	184.646	280.249	306.797
810127	42156.6	0.2314632	028.280	184.506	280.406	314.584
810203	42156.2	0.2314587	028.258	184.384	280.636	322.297
810211	42157.5	0.2310059	028.301	184.176	280.731	331.122
810218	42157.0	0.2308852	028.309	184.009	280.976	338.687
810224	42157.8	0.2305346	028.331	183.904	281.049	345.217
810303	42158.3	0.2305187	028.323	183.766	281.225	352.745
810311	42159.0	0.2300802	028.340	183.646	281.257	001.352
810325	42161.8	0.2297719	028.335	183.492	281.352	016.141
810401	42162.8	0.2298042	028.342	183.111	281.640	023.480
810408	42162.8	0.2296798	028.409	183.052	281.651	030.808
810415	42164.2	0.2295816	028.369	182.936	281.833	037.965
810422	42163.9	0.2296028	028.331	182.832	281.870	045.182
810429	42164.5	0.2296895	028.348	182.600	282.105	052.285

Table 1 (continued)

IUE Orbital Elements

<u>Epoch</u>	<u>Semi-Major Axis</u>	<u>Eccentricity</u>	<u>Inclination</u>	<u>Ascending Node</u>	<u>Arg of Perigee</u>	<u>Mean Anomaly</u>
810520	42165.9	0.2299073	028.296	182.222	282.406	073.346
810527	42166.3	0.2299676	028.304	182.053	282.608	080.212
810610	42167.3	0.2300499	028.293	181.736	282.948	093.797
810617	42167.9	0.2302336	028.278	181.583	283.080	100.540
810624	42167.5	0.2301423	028.296	181.393	283.316	107.159
810630	42169.4	0.2301987	028.280	181.265	283.428	112.844
810707	42168.3	0.2300517	028.304	181.086	283.692	119.330
810714	42170.0	0.2300483	028.303	180.948	283.838	125.833
810721	42169.0	0.2298296	028.323	180.772	284.068	132.243
810804	42170.0	0.2293954	028.348	180.450	284.439	144.910
810818	42170.7	0.2288902	028.381	180.167	284.766	157.389
810825	42173.2	0.2287818	028.397	180.022	284.879	163.567
810901	42172.4	0.2282902	028.385	179.861	285.090	169.661
810908	42174.3	0.2281934	028.406	179.762	285.145	175.736
810915	42173.2	0.2277780	028.430	179.599	285.292	181.759
810922	42175.7	0.2276914	028.406	179.511	285.404	187.708
811006	42177.3	0.2273203	028.416	179.181	285.598	199.539
811013	42175.9	0.2270177	028.429	179.093	285.662	205.352
811030	42150.2	0.2264961	028.398	178.775	285.898	219.518
811118	42153.5	0.2265575	028.389	178.343	286.294	241.479
811125	42153.0	0.2265783	028.377	178.211	286.378	249.502
811202	42154.8	0.2267068	028.367	178.025	286.583	257.432
811209	42154.7	0.2266656	028.369	177.904	286.664	265.345
811216	42156.4	0.2267103	028.374	177.700	286.935	273.114
811226	42156.2	0.2268223	028.358	177.471	287.165	284.209
811231	42157.6	0.2266634	028.383	177.353	287.318	289.680
820107	42157.6	0.2266777	028.379	177.217	287.443	297.347
820114	42158.8	0.2263722	028.406	177.019	287.710	304.869
820120	42159.2	0.2263835	028.405	176.898	287.818	311.354
820127	42158.9	0.2261478	028.414	176.734	288.049	318.788

Table 1 (continued)

IUE Orbital Elements

<u>Epoch</u>	<u>Semi-Major Axis</u>	<u>Eccentricity</u>	<u>Inclination</u>	<u>Ascending Node</u>	<u>Arg of Perigee</u>	<u>Mean Anomaly</u>
820203	42160.7	0.2259350	028.435	176.627	288.124	326.244
820210	42159.8	0.2255636	028.470	176.444	288.398	333.535
820310	42163.0	0.2244863	028.501	175.909	288.885	002.470
820331	42165.7	0.2242108	028.511	175.523	289.135	023.703
820407	42166.9	0.2238896	028.524	175.424	289.254	030.602
820414	42166.9	0.2240188	028.496	175.266	289.346	037.553
820421	42168.4	0.2238010	028.512	175.119	289.477	044.382
820428	42167.9	0.2240285	028.484	174.985	289.557	051.205
820505	42169.4	0.2238414	028.502	174.857	289.685	057.908
820512	42168.6	0.2241017	028.467	174.690	289.806	064.636
820519	42170.1	0.2239512	028.478	174.538	289.967	071.242
820526	42169.1	0.2242648	028.457	174.369	290.114	077.834
820602	42171.2	0.2240786	028.472	174.211	290.289	084.317
820609	42170.2	0.2243381	028.455	174.048	290.449	090.794
820623	42170.9	0.2243704	028.473	173.717	290.836	103.491
820707	42172.4	0.2241935	028.487	173.396	291.210	115.950
820714	42173.3	0.2238453	028.509	173.248	291.379	122.074
820721	42173.1	0.2238946	028.518	173.079	291.608	128.153
820728	42174.3	0.2235161	028.535	172.944	291.749	134.179
820819	42150.8	0.2223015	028.589	172.481	292.321	153.225
820825	42151.7	0.2219805	028.597	172.365	292.387	160.111
820901	42152.4	0.2217748	028.611	172.234	292.548	168.091
820908	42152.6	0.2213165	028.614	172.103	292.643	176.029
820915	42154.1	0.2211419	028.627	171.972	292.814	183.879
820922	42153.9	0.2208729	028.633	171.849	292.843	191.733
820929	42155.5	0.2206676	028.636	171.724	292.985	199.522
821006	42155.0	0.2204183	028.632	171.605	293.039	207.277
821013	42157.4	0.2202717	028.640	171.446	293.208	214.932
821020	42156.7	0.2202082	028.620	171.333	293.245	222.595
821027	42159.0	0.2200986	028.621	171.189	293.388	230.179

Table 1 (continued)

IUE Orbital Elements

<u>Epoch</u>	<u>Semi-Major Axis</u>	<u>Eccentricity</u>	<u>Inclination</u>	<u>Ascending Node</u>	<u>Arg of Perigee</u>	<u>Mean Anomaly</u>
821103	42157.8	0.2201008	028.604	171.073	293.433	237.729
821110	42160.4	0.2200087	028.610	170.886	293.628	245.169
821117	42159.6	0.2201615	028.598	170.760	293.696	252.614
821124	42162.2	0.2200996	028.608	170.599	293.869	259.952
821201	42161.0	0.2202317	028.591	170.448	293.974	267.263
821215	42163.2	0.2202642	028.588	170.131	294.312	281.634
821222	42164.5	0.2201057	028.625	169.958	294.532	288.716
821229	42163.9	0.2202181	028.611	169.830	294.656	295.775
830105	42165.5	0.2198857	028.641	169.656	294.894	302.715
830112	42164.8	0.2199761	028.653	169.460	295.085	309.664
830119	42165.9	0.2195559	028.669	169.329	295.273	316.500
830202	42167.0	0.2190551	028.704	169.043	295.609	330.027
830209	42167.8	0.2190360	028.708	168.888	295.755	336.739
830216	42167.6	0.2184788	028.733	168.771	295.898	343.344
830223	42169.1	0.2184936	028.734	168.636	296.024	349.937
830302	42169.1	0.2178860	028.744	168.548	296.140	356.433
830309	42170.9	0.2179132	028.754	168.362	296.267	002.947
830316	42171.0	0.2173997	028.767	168.257	296.351	009.368
830323	42172.7	0.2175065	028.760	168.113	296.468	015.760
830330	42172.8	0.2170700	028.772	168.010	296.529	022.084
830413	42174.7	0.2168169	028.762	167.736	296.729	034.616
830420	42175.3	0.2170515	028.751	167.584	296.873	040.778
830427	42176.2	0.2167943	028.746	167.461	296.933	046.900
830528	42153.5	0.2166429	028.738	166.784	297.536	073.374
830607	42155.3	0.2165119	028.747	166.553	297.784	085.825
830615	42153.9	0.2166739	028.754	166.364	298.026	093.647
830622	42156.0	0.2165238	028.762	166.225	298.158	101.460
830629	42155.0	0.2165476	028.785	166.043	298.395	109.189
830706	42156.9	0.2163013	028.790	165.939	298.518	116.864
830713	42155.5	0.2162580	028.812	165.746	298.776	124.445

Table 1 (continued)

IUE Orbital Elements

<u>Epoch</u>	<u>Semi-Major Axis</u>	<u>Eccentricity</u>	<u>Inclination</u>	<u>Ascending Node</u>	<u>Arg of Perigee</u>	<u>Mean Anomaly</u>
830720	42157.7	0.2160151	028.817	165.636	298.883	132.018
830727	42157.1	0.2158177	028.848	165.458	299.119	139.507
830803	42158.8	0.2154923	028.840	165.316	299.243	146.957
830810	42157.8	0.2152309	028.883	165.179	299.468	154.310
830817	42160.0	0.2149229	028.885	165.046	299.576	161.677
830831	42161.1	0.2142562	028.907	164.801	299.830	176.197
830907	42161.0	0.2138836	028.932	164.662	300.014	183.349
830914	42162.4	0.2136358	028.918	164.539	300.082	190.524
830921	42162.6	0.2132782	028.944	164.409	300.207	197.611
831005	42164.5	0.2127769	028.942	164.162	300.403	211.636
831012	42165.0	0.2127262	028.924	164.034	300.466	218.616
831026	42166.2	0.2125324	028.918	163.761	300.654	232.355
831109	42167.7	0.2124316	028.910	163.460	300.890	245.882
831116	42169.4	0.2122303	028.920	163.328	301.007	252.546
831123	42168.7	0.2124613	028.908	163.160	301.159	259.159
831130	42170.7	0.2122484	028.921	163.018	301.301	265.695
831207	42170.2	0.2124387	028.917	162.847	301.465	272.206
831221	42171.2	0.2124086	028.935	162.535	301.819	284.977
831228	42173.2	0.2120931	028.952	162.396	301.970	291.273
840119	42170.4	0.2116813	029.009	161.913	302.587	310.927
840125	42172.0	0.2113155	029.028	161.801	302.671	316.387
840201	42171.5	0.2111912	029.042	161.647	302.875	322.667
840215	42151.4	0.2106955	029.076	161.384	303.318	334.952
840222	42153.0	0.2101979	029.086	161.271	303.392	343.001
840229	42153.0	0.2100285	029.103	161.159	303.535	350.963
840315	42155.6	0.2094236	029.112	160.875	303.796	007.853
840322	42156.3	0.2091834	029.111	160.767	303.821	015.726
840329	42157.9	0.2089624	029.131	160.614	303.966	023.470
840404	42158.0	0.2088152	029.155	160.514	303.992	031.225
840419	42158.9	0.2086675	029.097	160.226	304.215	046.506

Table 2

IUE Orbit Corrective Maneuvers

<u>Date</u>	<u>GMT</u>		
780214	01:55	±	8 min
780724	16:34:04	±	1 sec
790620	18:37:10	±	1 sec
800213	02:16:01	±	1 sec
800624	16:34:59	±	1 sec
801216	06:10:02	±	1 sec
811029	09:24:47	±	1 sec
820817	13:53:44	±	1 sec
830527	19:07:28	±	1 sec
840112	03:41:09	±	1 sec
840214	20:00:00	±	1 sec