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DATA USERS' NOTE

MARINER 6 AND 7
PHOTOGRAPHIC DATA

(NSSDC ID NO. 69-014A-01 AND 69-030A-01)

MARCH 1971

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NATIONAL SPACE SCIENCE DATA CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION • GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.

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MARINER 6 AND 7 PHOTOGRAPHIC DATA
(NSSDC ID NO. 69-014A-01 AND 69-030A-01)

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March 1971

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FOREWORD

This Data Users' Note is designed to announce the availability and assist in the use of the complete set of Mariner 6 and 7 (1969 14A and 1969 30A) pictorial data. The Note describes the photographic mission of these two Mariner spacecraft, the television camera system, and the photographs that are available from the National Space Science Data Center (NSSDC). Two appendixes are included: one is a photographic catalog of all enhanced photographs, designated the maximum discriminability (optimal presentation) photographs; the other is a series of computer produced graphics that are useful in detailed analysis of the photographs.

NSSDC will supply, as resources permit, limited quantities of photographs without charge where they are to be used, first, for specific scientific research projects and, second, for instructional use in college-level science courses. All requesters should refer to the section on Ordering Procedures for specific ordering instructions. Scientists conducting an investigation that requires photographic data should inform NSSDC of their needs and should identify the nature of their study, their affiliation with a scientific organization, university, or company, and any government contracts they may have for performing the investigation. The Data Center seeks to keep informed of the results of any scientific investigation performed with the use of Mariner photographs. We therefore request that scientists submit reprints of any published papers to the Data Center so that the results of their studies can be made known to other users. It is also requested that in such papers NSSDC be acknowledged as the source of photographic data.

CONTENTS

	<u>Page</u>
BACKGROUND	1
PRINCIPAL INVESTIGATOR	1
TELEVISION SYSTEM	1
PHOTOGRAPHIC COVERAGE	6
FORMS OF AVAILABLE DATA	8
Raw Analog	8
Maximum Discriminability (Optimal Presentation)	20
Photometrically Decalibrated	20
Maximum Discriminability, Alternate Contrast Enhancements	21
Photo Mosaics	21
Maximum Discriminability Frames on Tape	22
Photometric Frames on Tape	22
GEOMETRICAL AND SUPPORT DATA	23
ORDERING PROCEDURES	23
BIBLIOGRAPHY	35
APPENDIX A - PHOTOGRAPHIC CATALOG	A-1
APPENDIX B - CONIC PROJECTIONS	B-1

LIST OF FIGURES

<u>Figure</u>	<u>Title</u>	<u>Page</u>
1	Spacecraft Configuration for Mariners 6 and 7 ..	2
2	Mariner 6 and 7 Instrument Package	4
3	Diagram Showing Video Signal Processing	7
4	Mariner 6 Near-Encounter Picture Tracks	9
5	Mariner 7 Near-Encounter Picture Tracks	10

<u>Figure</u>	<u>Title</u>	<u>Page</u>
6	Sample Photographs of All Versions	11
	a. Raw Analog	11
	b. Maximum Discriminability (Optimal Presentation)	11
	c. Photometrically Decalibrated	12
	d. Maximum Discriminability, Alternate Contrast Enhancements	12
7	Sample Printout of PEGASIS Data	24
8	Orientation of Image Plane Coordinates Used for PEGASIS	31
B-1	Cone Angle, Clock, Twist Angle Defined	B-2

LIST OF TABLES

<u>Table</u>	<u>Title</u>	<u>Page</u>
1	Characteristics of Television Cameras and Data Systems for Mariners 4, 6, and 7	5
2	List of Available Photographs	13
3	Definitions of Trajectory Program Para- meters and PEGASIS Parameters	26

MARINER 6 (1969 14A) AND 7 (1969 30A) PHOTOGRAPHIC DATA

BACKGROUND

Mariners 6 and 7 were launched from Cape Kennedy, Florida, on February 24 and March 27, 1969, respectively, and passed by Mars on July 31 and August 5, 1969. The Mariner 6 spacecraft crossed the equatorial zone of Mars in a west-east direction; Mariner 7 made a northwest-southeast pass, intersecting the course of Mariner 6 and continuing across the polar cap. Mariner 6 had an equatorial aiming point ($\approx -20^\circ$), which provided good coverage of the many light and dark surface features present in that region. The Mariner 7 aiming point ($-50^\circ < \theta < -30^\circ$) ($\theta = \text{latitude}$) provided coverage of the polar cap region including the polar cap edge.

The primary objectives of the mission included investigations of the surface and atmosphere of the planet Mars. To accomplish these goals, Mariner 6 and 7 each carried two vidicon cameras, an infrared spectrometer, an infrared radiometer, and an ultraviolet spectrometer. A celestial mechanics experiment and an S-band occultation experiment, which required no additional instrumentation, were also conducted.

The configuration of the 380-kg spacecraft used in the two Mariner missions is shown in figure 1.

PRINCIPAL INVESTIGATOR

Dr. Robert B. Leighton, California Institute of Technology

TELEVISION SYSTEM

The photographic instrumentation on the Mariners was designed to (1) determine the physiography over much of the planet at a resolution significantly better than that of Mariner 4, topographically categorize the light and dark areas, and perhaps learn more about why the areas undergo seasonal variation; (2) further explore geographically the unknown planetary surface for additional clues to its origin; and (3) obtain sufficient photographic coverage at a suitable resolution to distinguish, on the basis of crater morphology and other criteria, between an episodic and a continuous history.

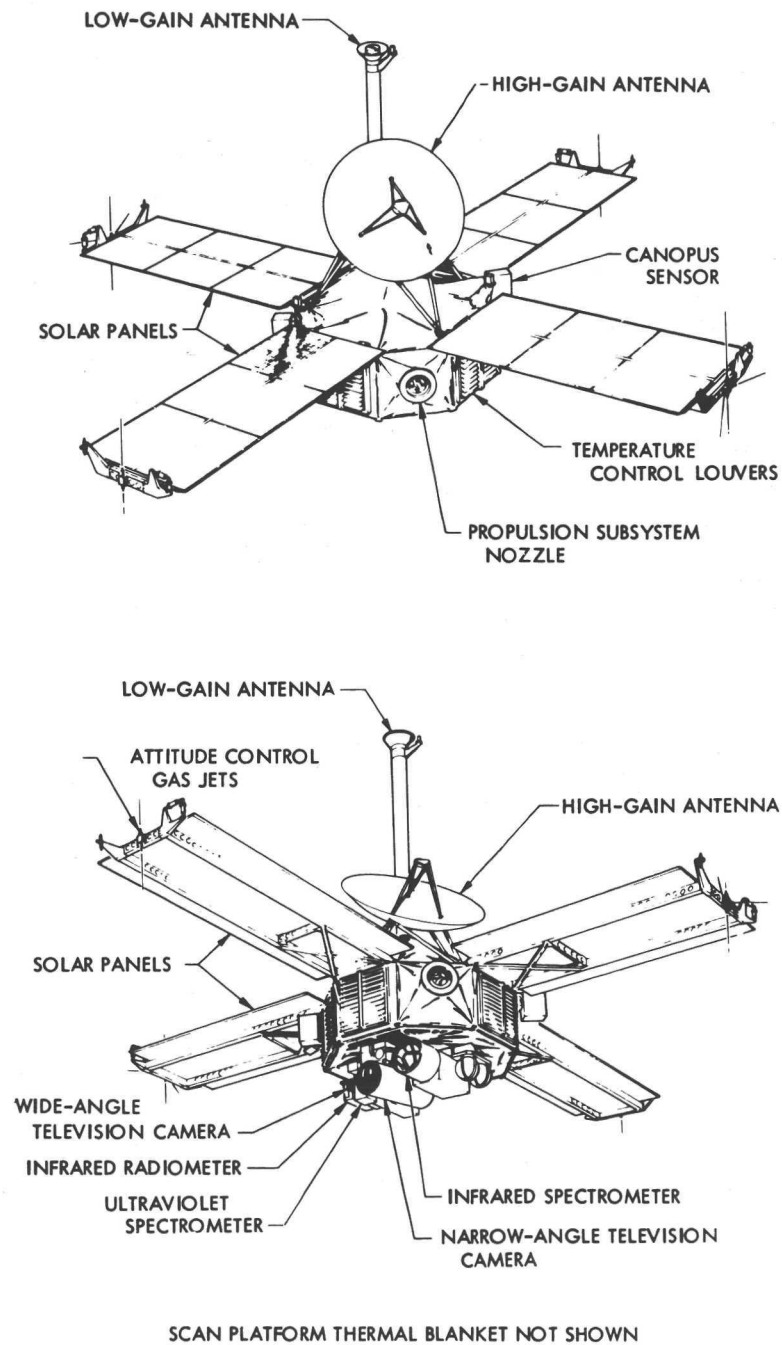


Figure 1. Spacecraft Configuration for Mariners 6 and 7

The experiment package used on Mariners 6 and 7 is shown in figure 2. The characteristics of the television cameras are given in table 1. Here, the characteristics of Mariners 6 and 7 can be compared with those of Mariner 4. These cameras operated in a far-encounter (FE) mode and a near-encounter (NE) mode, which was the 20 min during the closest approach of the spacecraft to the planet.

Each spacecraft utilized two boresighted vidicon cameras so that both high-resolution and wide-area coverage could be obtained. The TV system transmitted both real-time and stored imagery back to earth. Camera A, the wide-angle camera (used primarily during near-encounter), had a focal length of 52.5 mm, an iris setting of f/5.6, a field of view of $11^\circ \times 14^\circ$, and both "fast" (90 msec) and "slow" (180 msec) shutter speeds. This camera was equipped with red, green, and blue filters which rotated in a red, green, blue, green, etc., sequence. Pictures from the wide-angle camera covered about 100 times more surface area than pictures taken with the narrow-angle camera. Camera B, the narrow-angle camera (used in both near- and far-encounter) was boresighted with the wide-angle camera. A modified Schmidt-Cassegrain telescope provided a linear resolution 10 times greater than that of the wide-angle camera. The iris setting on this camera was f/2.5, the focal length, 508 mm, the field of view, $1.1^\circ \times 1.4^\circ$, and the shutter speeds, 6 msec and 12 msec. The camera was equipped with a minus-blue haze filter.

In the near-encounter mode, the camera shutters operated alternately. They were timed to provide overlapping of the wide-angle pictures, with the narrow-angle pictures falling inside the overlapped portion to aid in interpretation. Each camera took one picture every 84.48 sec.

The vidicon tube in each camera had a surface sensitive to light and lost an electrical charge proportional to the intensity of the light striking the surface of the tube. An electron beam scanned 665,280 points on the target in 42.24 sec and generated an electrical current proportional to the charge loss at each point and, therefore, in proportion to the light value for each point. This converted the image to electronic information, which was stored in the spacecraft tape recorders.

The two cameras had identical picture formats and electronic circuits. The cameras shared a digital tape recorder to store the six lowest order bits of an 8-bit encoded word for every seventh picture element (or pixel) along each television picture line (referred to as 1/7 digital data). A second, analog tape recorder stored analog data for all pixels and was the primary data storage system.

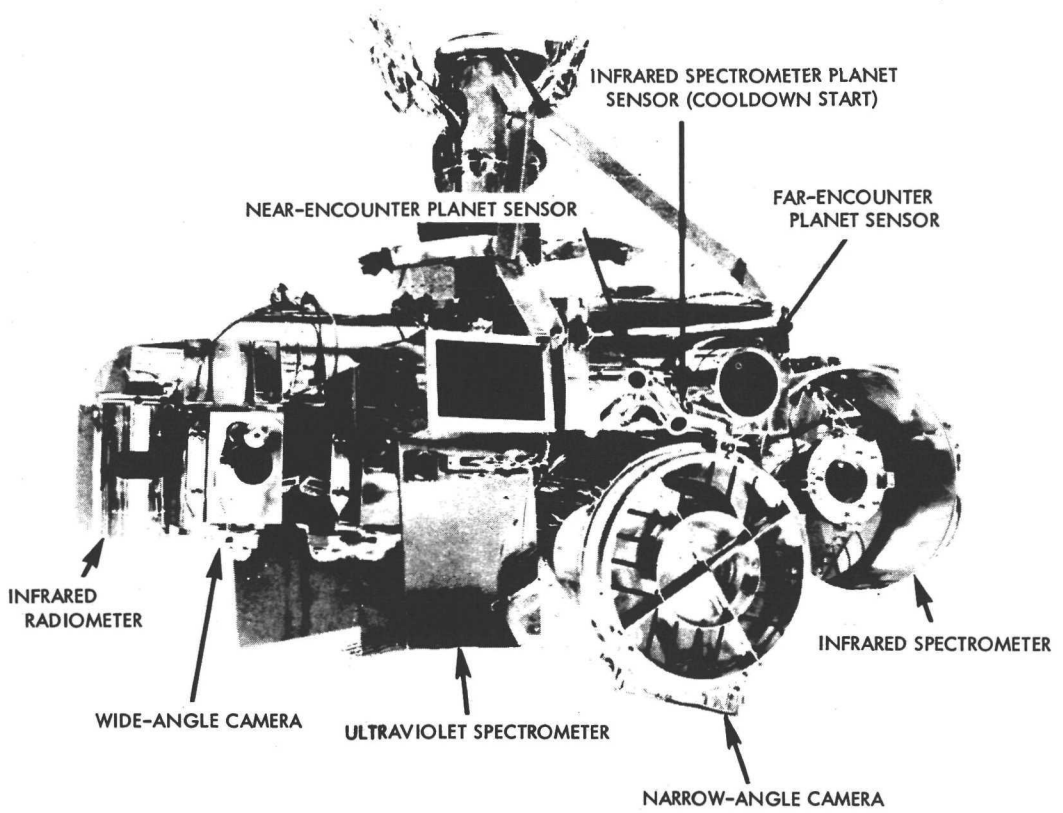


Figure 2. Mariner 6 and 7 Instrument Package

TABLE 1
 CHARACTERISTICS OF TELEVISION CAMERAS AND DATA
 SYSTEMS FOR MARINERS 4, 6, AND 7

Item	Mariner 4	Mariner 6 and 7 cameras	
		Wide-angle	Narrow-angle
Optics:			
Aperture, mm	60	10	200
Focal length, mm	305	52	508
T-number	8	6.5	3.6, 3.84
Type	Simple Cassegrain	Lens	Equal-radii Schmidt-Cassegrain
Shutter	4-position rotary	4-position rotary	2-blade, right-left
Exposure (fast, slow), msec	85; 200	90; 180	6; 12
Filters; effective wavelength, nm	600 (red)	573 (red)	—
	—	526 (green)	560
	540 (green)	469 (blue)	—
Picture:			
Absolute size, mm	5.5×5.5	9.6×12.3	9.6×12.3
Angular field, deg	1.1×1.1	11×14	1.1×1.4
Resolution elements (pixels)	200×200	704×935	704×935
Frame readout time, sec	24	42.25	42.25
Picture interval, sec	48	84.5	84.5
Encoding levels, $N=2^n$	$n=6$	$n=8$	$n=8$
		Digital	Analog
Tape recorders:			
Number	1	1	1
Tracks	4	4	4
Tape length, m	100	110	110
Stored bits (effective)	5×10^6	1.3×10^7	1.2×10^8
Tape speed, cm/sec:			
Record	32.5	30	30
Playback	0.025	4.3	4.3
Data transmission rates:			
As used, bps	$8\frac{1}{3}$	16.2×10^3	16.2×10^3
Backup, bps	—	270	270

To increase the contrast of the near-encounter analog pictures, the average signal level was held nearly constant, and the modulation index was increased by automatic gain control (AGC) and a cube-law contrast enhancement circuit. This signal processing required that an elaborate program of computer restoration of the pictorial data be used after receipt on earth. Figure 3 illustrates the television picture data as it is first received, recorded, transmitted to earth, and reconstructed. The AGC was not used during far-encounter.

Since the signal transmitted from spacecraft to earth was in binary form, the analog data were converted to digital data before transmission. When received on earth, the binary coding was reconverted to electrical impulses, which represented the pattern of light and dark elements of the original image on the vidicon tube. These electrical impulses were used to modify the intensity of a beam of light that swept across a 70-mm negative to expose it and thus re-create the original image.

The reconstructed pictures were displayed on a cathode ray tube (CRT) at the Jet Propulsion Laboratory.

The available photographs are:

Mariner 6 Near-Encounter	- 25 frames	(6N1 -- 6N25)*
Mariner 6 Far-Encounter	- 50 frames	(6F1 -- 6F50)
Mariner 7 Near-Encounter	- 33 frames	(7N1 -- 7N33)
Mariner 7 Far-Encounter	- 93 frames	(7F1 -- 7F93)

PHOTOGRAPHIC COVERAGE

The picture track for Mariner 6 was chosen to cover a broad longitude range at low latitudes to bring into view some well studied transitional zones between light and dark areas, two "oases" (Juventae Fons and Oxia Palus), and a variable light region (Deucalionis Regio). The Mariner 7 picture track was selected to cross that of Mariner 6 on the dark area, Meridiani Sinus, thus providing views of that important region under different lighting conditions. It was also arranged for the track to include the south polar cap and cap edge; to intersect the "wave of darkening" feature, Hellepontus; and to cross Hellas, the bright circular desert.

*See section on Ordering Procedures for explanation of numbering system.

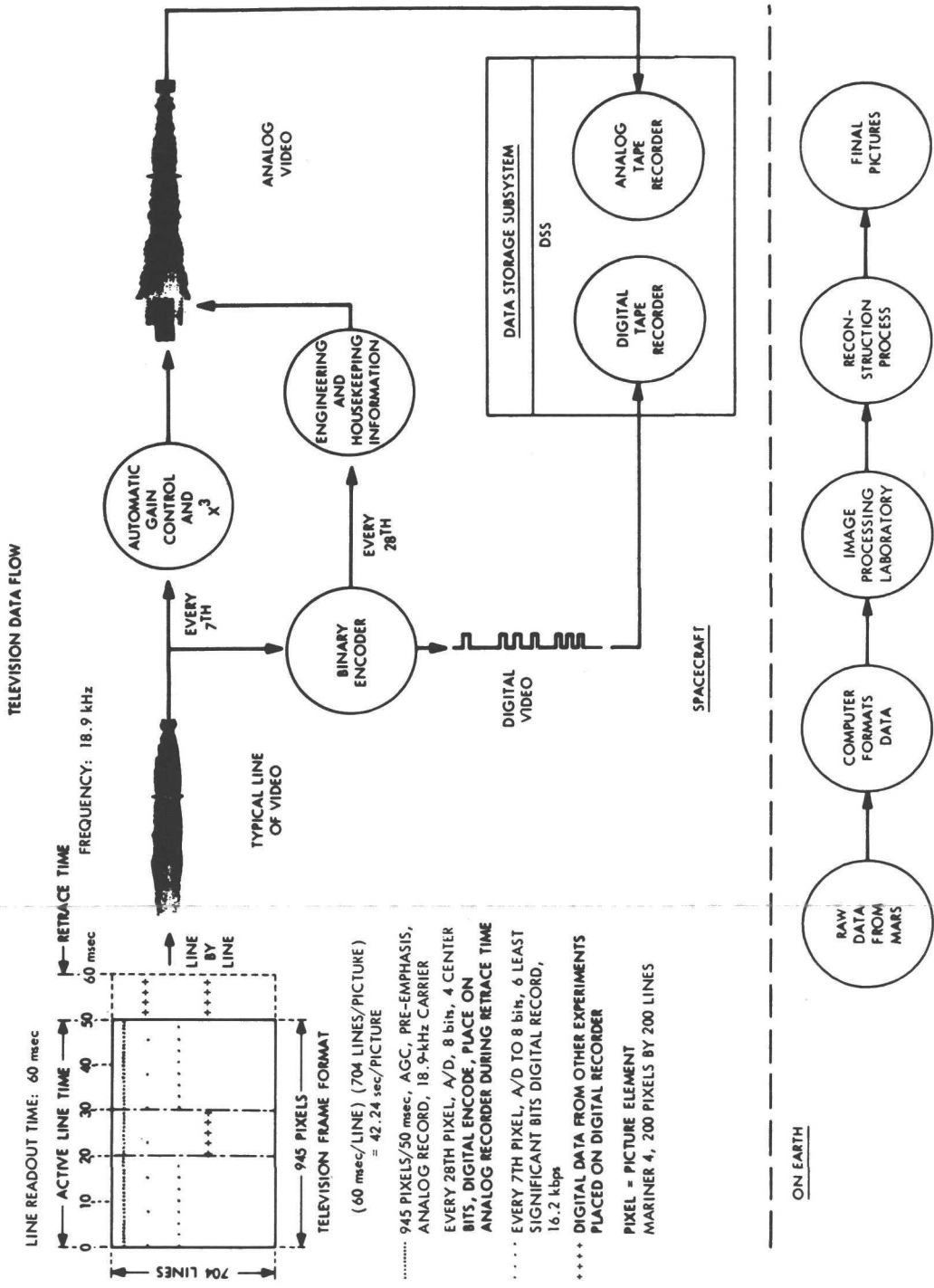


Figure 3. Diagram Showing Video Signal Processing

The Mariner 6 near-encounter picture tracks are shown plotted in figure 4; the Mariner 7 picture tracks are shown in figure 5. Note that the wide-angle and narrow-angle pictures were taken alternately. The first wide-angle picture was taken with a blue filter, the next, with a green filter, then red, then green, after which the sequence was begun again.

FORMS OF AVAILABLE DATA

The pictorial data obtained from Mariners 6 and 7 have been processed in several ways to bring out details that appear subtle in the raw-analog version. All of the film versions are available on 70-mm black and white film, and reproductions of selected frames can be obtained as enlarged 8- X 10-in. film stock. For NSSDC accounting purposes, an ID number identifies separately each near-encounter and far-encounter version of the photographs. This NSSDC ID No. is based on the spacecraft international designation followed by an NSSDC assigned data set identification number.

A sample photograph in all available versions has been selected to illustrate the different characteristics of the photographic data sets (see figure 6). Immediately following the sample photographs, a chart lists all the available photographic frames and indicates the versions in which they can be obtained (table 2). Where more than one enhancement of a given frame in a particular version has been processed, the total number is indicated.

The January 10, 1971, issue of the Journal of Geophysical Research, Vol. 76, No. 2, contains 12 special papers on Mariners 6 and 7. These papers include interpretive and analytic studies of the photographs as well as final reports on the photographic system. These papers are recommended for investigators of the photographs.

Raw Analog

The original version of the Mariner 6 and 7 films was photographed on 70-mm film from the original image on the CRT. These photographs were a direct product of the digitized TV signals received at the processing laboratory. They were in no way enhanced, sharpened, or rectified.

At NSSDC, the 25 Mariner 6 Raw-Analog Near-Encounter photographs are designated data set 69-014A-01A. The 50 Raw-Analog Far-Encounter photographs are designated 69-014A-01B.

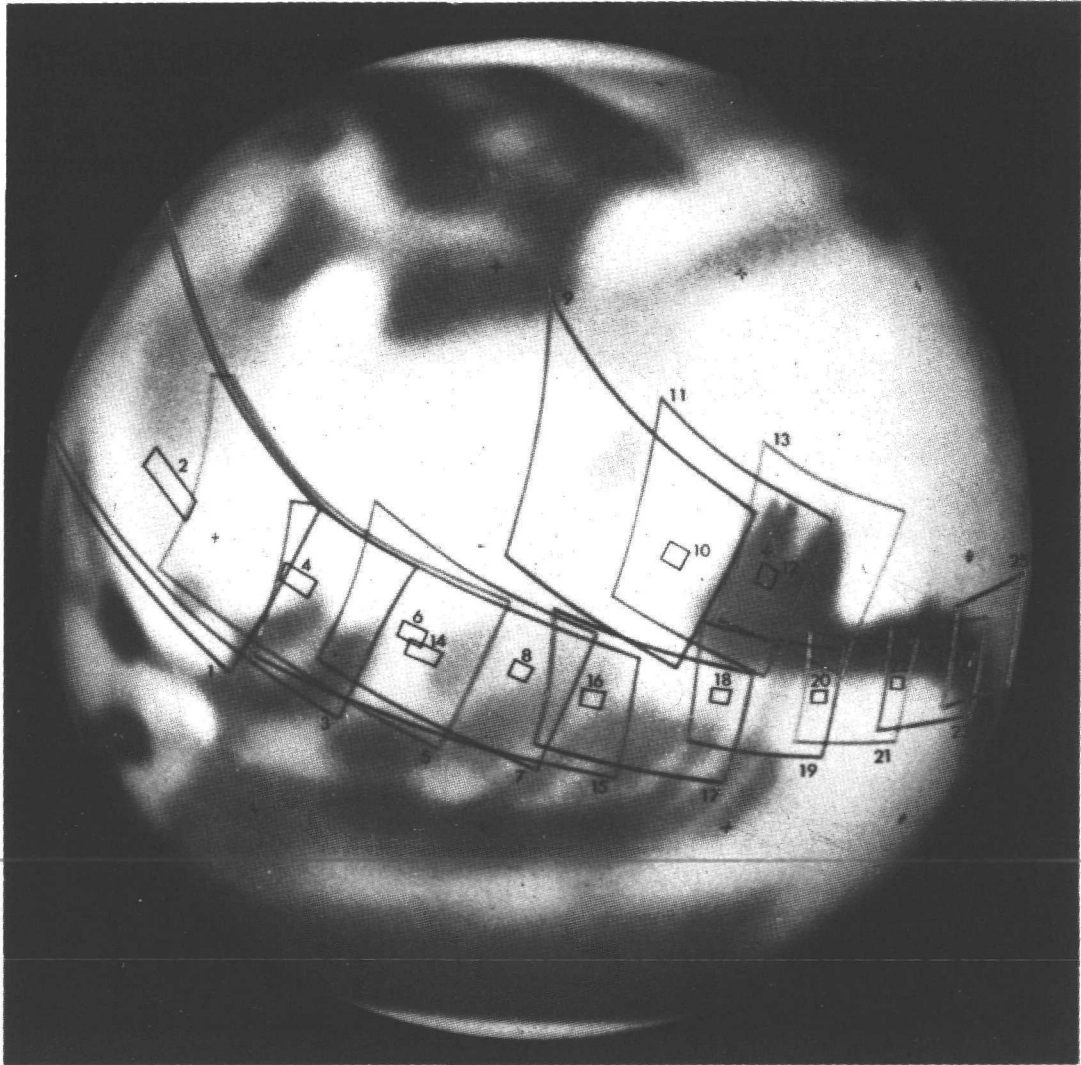


Figure 4. Mariner 6 Near-Encounter Picture Tracks

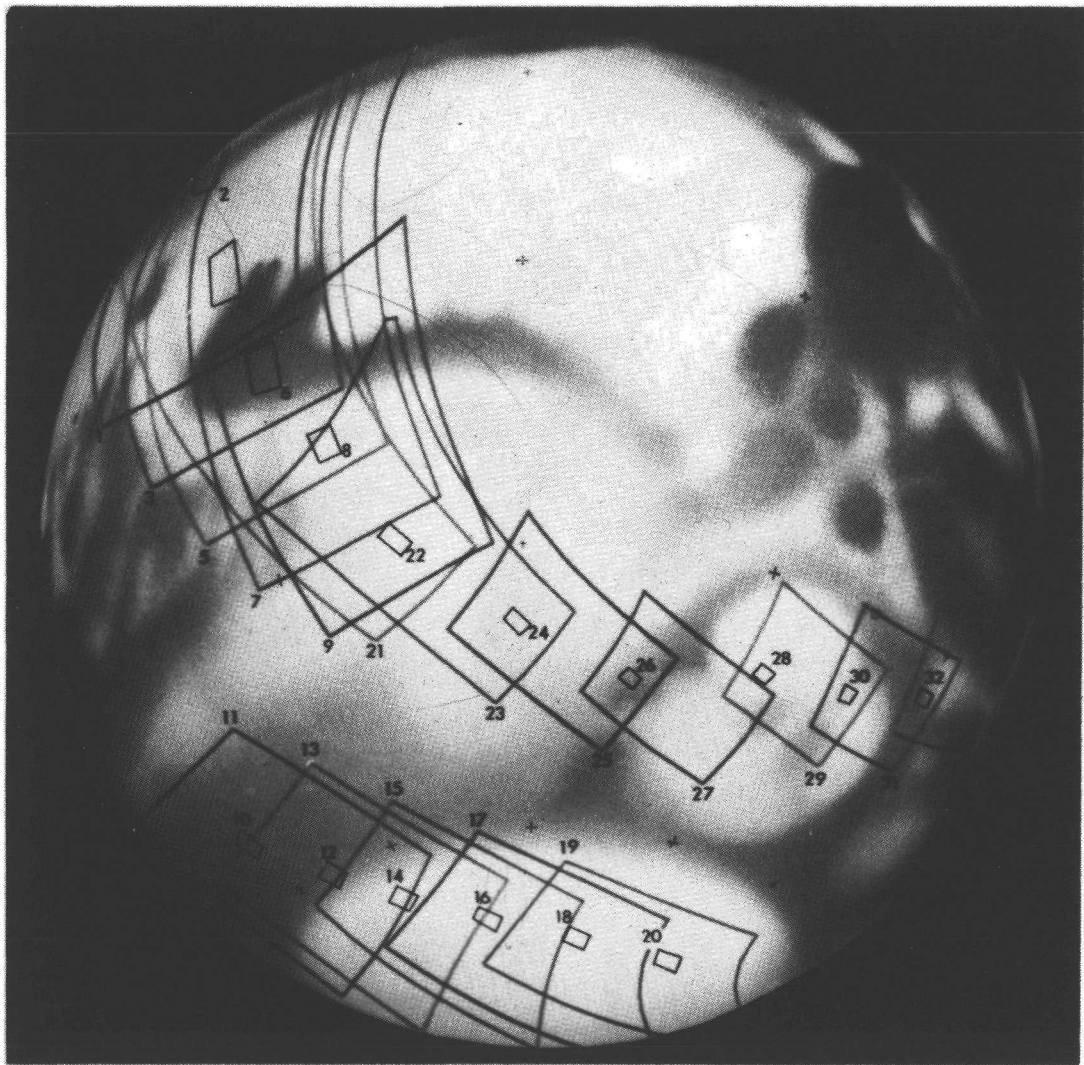
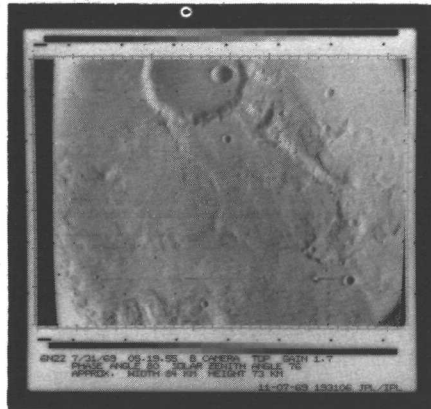
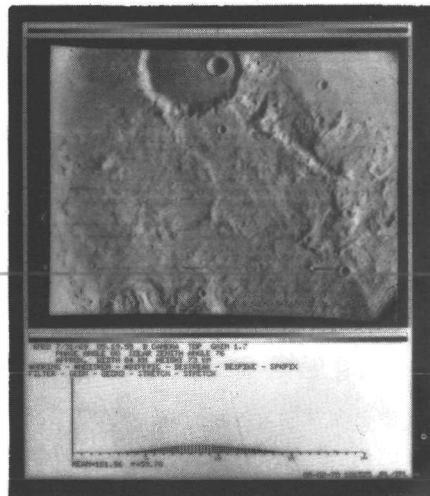


Figure 5. Mariner 7 Near-Encounter Picture Tracks

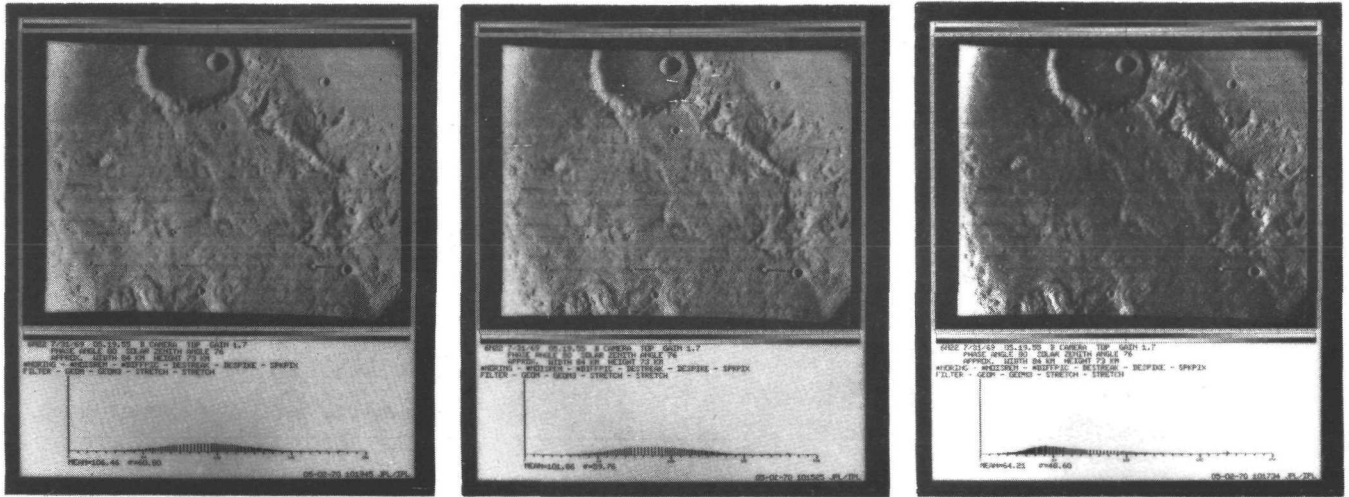


a. Raw analog

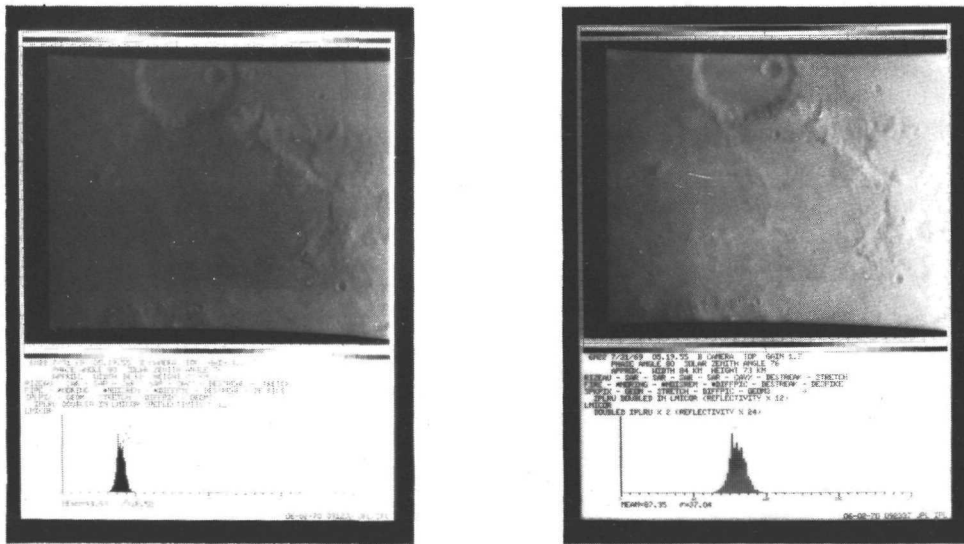


b. Maximum Discriminability

Figure 6. Sample Photographs of All Versions



c. Alternate contrast



d. Photometric

Figure 6 (cont.) - Sample Photographs of All Versions

TABLE 2

LIST OF AVAILABLE PHOTOGRAPHS

Mariner 6 Near-Encounter

Frame No.	69-014A-01A ¹	69-014A-01C ²	69-014A-01E ³	69-014A-01G ⁴
6N1	1	1	2	3
6N2	1	1	2	3
6N3	1	1	2	3
6N4	1	1	2	3
6N5	1	1	2	3
6N6	1	1	2	3
6N7	1	1	2	3
6N8	1	1	2	3
6N9	1	1	2	3
6N10	1	1	2	3
6N11	1	1	2	3
6N12	1	1	2	3
6N13	1	1	2	3
6N14	1	1	2	3
6N15	1	1	2	3
6N16	1	1	2	3
6N17	1	1	2	3
6N18	1	1	2	3
6N19	1	1	2	3
6N20	1	1	2	3
6N21	1	1	2	3
6N22	1	1	2	3
6N23	1	1	2	3
6N24	1	1	2	3
6N25	1	1	2	1

Mariner 6 Far-Encounter

Frame No.	69-014A-01B ¹	69-014A-01D ²	69-014A-01F ³	69-014A-01H ⁴
6F1	1	1	1	3
6F2	1	1	1	4

¹Raw Analog ²Maximum Discriminability ³Photometrically Decalibrated
⁴Maximum Discriminability, Alternate Contrast

TABLE 2 (continued)

Mariner 6 Far-Encounter (continued)

Frame No.	69-014A-01B ¹	69-014A-01D ²	69-014A-01F ³	69-014A-01H ⁴
6F3	1	1	1	4
6F4	1	1	1	4
6F5	1	1	1	4
6F6	1	1	1	4
6F7	1	1	1	4
6F8	1	1	1	4
6F9	1	1	1	4
6F10	1	1	1	4
6F11	1	1	1	4
6F12	1	1	1	4
6F13	1	1	1	4
6F14	1	1	1	4
6F15	1	1	1	4
6F16	1	1	1	4
6F17	1	1	1	4
6F18	1	1	1	4
6F19	1	1	1	4
6F20	1	1	1	4
6F21	1	1	1	4
6F22	1	1	1	4
6F23	1	1	1	4
6F24	1	1	1	4
6F25	1	1	1	4
6F26	1	1	1	4
6F27	1	1	1	4
6F28	1	1	1	4
6F29	1	1	1	4
6F30	1	1	1	4
6F31	1	1	1	4
6F32	1	1	1	4
6F33	1	1	1	4
6F34	1	1	1	4
6F35	1	1	1	4
6F36	1	1	1	4
6F37	1	1	1	4

¹Raw Analog ²Maximum Discriminability ³Photometrically Decalibrated⁴Maximum Discriminability, Alternate Contrast

TABLE 2 (continued)

Mariner 6 Far-Encounter (continued)

Frame No.	69-014A-01B ¹	69-014A-01D ²	69-014A-01F ³	69-014A-01H ⁴
6F38	1	1	1	4
6F39	1	1	1	4
6F40	1	1	1	4
6F41	1	1	1	4
6F42	1	1	1	4
6F43	1	1	1	4
6F44	1	1	1	4
6F45	1	1	1	4
6F46	1	1	1	4
6F47	1	1	1	4
6F48	1	1	1	4
6F49	1	1	1	4
6F50	1	0	0	0

Mariner 7 Near-Encounter

Frame No.	69-030A-01A ¹	69-030A-01C ²	69-030A-01E ³	69-030A-01G ⁴
7N1	1	1	2	3
7N2	1	1	2	3
7N3	1	1	2	3
7N4	1	1	2	3
7N5	1	1	2	3
7N6	1	1	2	3
7N7	1	1	2	3
7N8	1	1	2	2
7N9	1	1	2	3
7N10	1	1	2	0
7N11	1	1	2	3
7N12	1	1	2	0
7N13	1	1	2	3
7N14	1	1	2	2
7N15	1	1	2	3

¹Raw Analog ²Maximum Discriminability ³Photometrically Decalibrated
⁴Maximum Discriminability, Alternate Contrast

TABLE 2 (continued)

Mariner 7 Near-Encounter (continued)

Frame No.	69-030A-01A ¹	69-030A-01C ²	69-030A-01E ³	69-030A-01G ⁴
7N16	1	1	2	3
7N17	1	1	2	3
7N18	1	1	2	3
7N19	1	1	2	3
7N20	1	1	2	3
7N21	1	1	2	3
7N22	1	1	2	3
7N23	1	1	2	2
7N24	1	1	2	3
7N25	1	1	2	3
7N26	1	1	2	3
7N27	1	1	2	3
7N28	1	1	2	4
7N29	1	1	2	4
7N30	1	1	2	0
7N31	1	1	2	3
7N32	1	1	0	0
7N33	1	0	0	0

Mariner 7 Far-Encounter

Frame No.	69-030A-01B ¹	69-030A-01D ²	69-030A-01F ³	69-030A-01H ⁴
7F1	1	1	1	4
7F2	1	1	1	4
7F3	1	1	1	4
7F4	1	1	1	4
7F5	1	1	1	4
7F6	1	1	1	4
7F7	1	1	1	4
7F8	1	1	1	4
7F9	1	1	1	4
7F10	1	1	1	4
7F11	1	1	1	4

¹Raw Analog ²Maximum Discriminability ³Photometrically Decalibrated⁴Maximum Discriminability, Alternate Contrast

TABLE 2 (continued)

Mariner 7 Far-Encounter (continued)

Frame No.	69-030A-01B ¹	69-030A-01D ²	69-030A-01F ³	69-030A-01H ⁴
7F12	1	1	1	4
7F13	1	1	1	4
7F14	1	1	1	4
7F15	1	1	1	4
7F16	1	1	1	4
7F17	1	1	1	4
7F18	1	1	1	4
7F19	1	1	1	4
7F20	1	1	1	4
7F21	1	1	1	4
7F22	1	1	1	5
7F23	1	1	1	5
7F24	1	1	1	5
7F25	1	1	1	5
7F26	1	1	1	4
7F27	1	1	1	4
7F28	1	1	1	4
7F29	1	1	1	4
7F30	1	1	1	4
7F31	1	1	1	4
7F32	1	1	1	4
7F33	1	1	1	4
7F34	1	0	0	0
7F35	1	1	1	4
7F36	1	1	1	4
7F37	1	1	1	4
7F38	1	1	1	4
7F39	1	1	1	4
7F40	1	1	1	4
7F41	1	1	1	4
7F42	1	1	1	4
7F43	1	1	1	4
7F44	1	1	1	5
7F45	1	1	1	5
7F46	1	1	1	5
7F47	1	1	1	5
7F48	1	1	1	5
7F49	1	1	1	5

¹Raw Analog ²Maximum Discriminability ³Photometrically Decalibrated
⁴Maximum Discriminability, Alternate Contrast

TABLE 2 (continued)

Mariner 7 Far-Encounter (continued)

Frame No.	69-030A-01B ¹	69-030A-01D ²	69-030A-01F ³	69-030A-01H ⁴
7F50	1	1	1	5
7F51	1	1	1	5
7F52	1	1	1	5
7F53	1	1	1	5
7F54	1	1	1	5
7F55	1	1	1	6
7F56	1	1	1	6
7F57	1	1	1	6
7F58	1	1	1	5
7F59	1	1	1	5
7F60	1	1	1	5
7F61	1	1	1	5
7F62	1	1	1	5
7F63	1	1	1	5
7F64	1	1	1	5
7F65	1	1	1	5
7F66	1	1	1	5
7F67	1	1	1	5
7F68	1	0	0	0
7F69	1	1	1	5
7F70	1	1	1	5
7F71	1	1	1	5
7F72	1	1	1	5
7F73	1	1	1	4
7F74	1	1	1	4
7F75	1	1	1	4
7F76	1	1	1	4
7F77	1	1	1	4
7F78	1	1	1	4
7F79	1	1	1	4
7F80	1	1	1	4
7F81	1	1	1	4
7F82	1	1	1	4

¹Raw Analog ²Maximum Discriminability ³Photometrically Decalibrated⁴Maximum Discriminability, Alternate Contrast

TABLE 2 (continued)

Mariner 7 Far-Encounter (continued)

Frame No.	69-030A-01B ¹	69-030A-01D ²	69-030A-01F ³	69-030A-01H ⁴
7F83	1	1	1	4
7F84	1	1	1	4
7F85	1	1	1	4
7F86	1	1	1	4
7F87	1	1	1	4
7F88	1	1	1	4
7F89	1	1	1	4
7F90	1	1	1	4
7F91	1	1	1	4
7F92	1	1	1	4
7F93	1	1	1	4

¹Raw Analog ²Maximum Discriminability ³Photometrically Decalibrated
⁴Maximum Discriminability, Alternate Contrast

The comparable data sets of Mariner 7, 33 Raw-Analog Near-Encounter photographs and 93 Raw-Analog Far-Encounter photographs, are designated 69-030A-01A and 69-030A-01B, respectively.

Further processing by the Jet Propulsion Laboratory has yielded several additional sets of photographs, as listed below, that NSSDC can now distribute.

Maximum Discriminability (Optimal Presentation)

This version of the Mariner photographic data is the original enhanced 70-mm negative version of the Mars photographs. A high pass filtering technique on the spacecraft of the video signal was performed, and this tended to bring out and remove the large differences of contrast. Small-scale detail was enhanced, system noises were suppressed, and geometric distortions were corrected by digital processing of the images, both on the spacecraft and on the ground during video reconstruction and rectification. Improvement of apparent image resolution and sharpening of features was accomplished through a filtering process. These photographs provide the maximum quality images for photo interpretation. It should be noted, however, that photometric information has been sacrificed for the enhancement of detail. This version is available for Mariners 6 and 7 near-encounter and far-encounter.

Data Set 69-014A-01C includes the 25 near-encounter photographs from Mariner 6.

Data Set 69-014A-01D consists of 49 of the far-encounter photographs from Mariner 6.

Data Set 69-030A-01C consists of 32 of the near-encounter photographs from Mariner 7.

Data Set 69-030A-01D includes 91 of the far-encounter photographs from Mariner 7.

Photometrically Decalibrated

This version of the Mariner photographs has been digitally processed to remove the effects of the TV systems and to depict the actual scene luminance and large-scale albedo variations, not small-scale details. This representation is rather flat in contrast for all the Martian terrain tonal characteristics. The spacecraft vidicons were calibrated to determine the relationship between the input luminance and the camera output signal as a function of position in each frame. Each picture element was then treated as a tiny photometer with unique transfer properties. The recorded output signal was converted to the actual scene luminance, and the results were stored in the corrected output image. Two copies of each frame in this version

are available in order to obtain the best usage of the data number range of 0 to 255. One frame is six times the percentage of reflectance and the other 12 times the percentage of reflectance.

Data Set 69-014A-01E consists of the 25 near-encounter photographs from Mariner 6.

Data Set 69-014A-01F includes 49 of the far-encounter photographs from Mariner 6.

Data Set 69-030A-01E consists of 31 of the near-encounter photographs from Mariner 7.

Data Set 69-030A-01F consists of 91 of the far-encounter Mariner 7 photographs.

Maximum Discriminability, Alternate Contrast Enhancements

The original raw-analog video data from Mariner were digitally processed to produce contrast enhanced photographs. Slightly different procedures were used for the far-encounter and near-encounter photographs. In both cases, contrast enhancement, suppression of system noises, and emphasis on small detail were brought out through digital processing during video reconstruction and rectification. Each frame that was processed is available in as many as six versions to enhance the detail contained in that photograph.

Data Set 69-014A-01G consists of alternate contrast versions of 24 Mariner 6 near-encounter photographs of Mars. (Frame 6N25 was processed only once.)

Data Set 69-014A-01H consists of three or four alternate versions of 49 of the far-encounter Mariner 6 photographs, totaling 195 frames. The procedure for the far-encounter photographs divided the 256-level gray scale into the dark area, light area, and polar cap regions. For each of the specialized versions, one of the three gray scale regions was processed to bring out detail by a computer procedure called stretching.

Data Set 69-030A-01G includes 31 contrast enhanced Mariner 7 near-encounter photographs, which were processed in the same manner as the photographs in data set 69-014A-01G, totaling 83 frames with up to four versions of each frame.

Data Set 69-030A-01H includes 91 contrast enhanced far-encounter Mariner 7 photographs, which were processed in the same manner as the photographs in data set 69-014A-01H, totaling 399 frames with up to six versions of each frame.

Photo Mosaics

Near-encounter photographs have been assembled into mosaics to provide a broader view of the Martian surface. All the near-encoun-

ter pictures except those at the terminator are included. These photographs are shown in appendix A.

Data Set 69-014A-01I consists of two mosaics assembled from the near-encounter photographs of Mariner 6. The first mosaic, composed of frames 6N1-6N8, portrays the Aurorae Sinus area. The second mosaic, composed of frames 6N9-6N23, covers the Meridiani Sinus area.

Data Set 69-030A-01I includes five mosaics assembled from the Mariner 7 near-encounter photographs. The first mosaic (frames 7N1-7N3) covers the limb, the second (frames 7N4-7N9) covers the Meridiani Sinus area, and the third mosaic (7N10-7N20) shows the polar cap and is presented in the photometric version. The fourth mosaic (frames 7N10-7N20) is the polar cap in the maximum discriminability version. The last mosaic (frames 7N21-7N31) covers Noachis-Hellas.

Maximum Discriminability Frames on Tape

A complete set of binary picture data from all the near-encounter maximum discriminability photographs is available on tape. Each file on the tapes contains a single picture, and each record in a file corresponds to a line of a TV picture. A pixel is written in binary as an 8-bit byte. Preceding the binary picture data of each file are several label records written in EBCDIC. These records, containing five 72-byte logical records each, indicate the number of lines and samples in the subsequent file, the picture identification, and a history of the computer processing to which the picture has been subjected.

Data Set 69-014A-01J consists of two 7-track binary tapes with odd parity at 800 bpi written on an IBM 360 computer. These tapes contain only the Mariner 6 near-encounter maximum discriminability pictures.

Data Set 69-030A-01J consists of three 7-track binary tapes with odd parity at 800 bpi written on an IBM 360 computer. These tapes contain only the Mariner 7 near-encounter maximum discriminability pictures.

Photometric Frames on Tape

The photometric data for all Mariner 6 and 7 photographs, both near-encounter and far-encounter, are contained on 7-track binary magnetic tapes written with odd parity at 800 bpi written on an IBM 360. Each file contains the binary data for a single picture, and each record in a file corresponds to one line of a TV picture. A picture element is written in binary as an 8-bit byte. Preceding the

binary records of each file are several label records written in EBCDIC. These records indicate the number of lines and samples in the subsequent file, picture identification, and a history of the computer processing to which the pictures have been subjected. Documentation describing the genesis and scaling of the numerical photometric data is available at NSSDC and may be requested for use with the tapes.

Data Set 69-014A-01K consists of two tapes containing the complete set of Mariner 6 near-encounter digital photometric photographs.

Data Set 69-014A-01L consists of four tapes containing the complete set of Mariner 6 far-encounter digital photometric photographs.

Data Set 69-030A-01K consists of three tapes containing the complete set of Mariner 7 near-encounter digital photometric photographs.

Data Set 69-030A-01L consists of six tapes containing the complete set of Mariner 7 far-encounter digital photometric photographs.

GEOMETRICAL AND SUPPORT DATA

The JPL Mission Analysis Division prepared the PEGASIS and PEGASIS PLOT computer programs for the generation of tabular and graphic data in support of the Mariner 6 and 7 TV picture analyses. The PEGASIS PLOT program produces plots that simulate the actual scene viewed by the cameras whereas the PEGASIS program presents data for each of nine points within each camera's field of view. Post-encounter TV and trajectory data were used. The printout in figure 7 is a sample of the PEGASIS data. These data are useful for very detailed analyses. A complete printout can be obtained from NSSDC by users whose study requires this support. Definitions of the integrated trajectory program parameters and PEGASIS parameters thought to be of general interest are included in table 3. A complete list of all output parameters can be found in bibliography items 3 and 8. Figure 8 illustrates the orientation of image plane coordinates used for PEGASIS.

ORDERING PROCEDURES

The Mariner Photography Order Form enclosed with this Note is provided for the requester's convenience. All parts of the form must be completed to ensure satisfactory request fulfillment. If the photo-

MISSION DATA AND TRAJECTORY CONSTANTS

LAUNCH 2/24/1969	HCA 3373.61	SMAX 825.58	CREOR 69.93	CLATS 6.23	LUTP 24.69
	RCA 6767.01	ECCH 9.20	CRANG 68.16	CLOMS 262.80	LOTH 32.57
ARRIVE 7/31/1969	REE 7547.57	RADP 3393.40	LECA -23.07	DECLS 0.00	LOTH 40.44
	B-T 7540.93	GRAV 42820.42	LONGA 20.00	RASCS 0.00	ZTAZ 158.16
JUCA 2440433.7215D 00	B-R -316.46	INEQ 24.70	DECCA 3.05	LATSS -7.80	ETAZ 159.03
	THE -2.40	INEC 7.31	RASCA 178.75	LOMSS 302.57	ZTAC 109.37
HR MIN SEC	VCA 8.03	EQOR 333.55	LATVI -5.85	LATSE 10.81	FTAC 264.55
TCA 5 18 54.17	VIN 7.20	EQAN 5.85	LOMVI 280.65	LOMSE 268.37	ZTAF 159.35
JTI 0 0 0.00	STN 83.52	UMEG 290.35	LONEQ 65.31	LONEC 298.33	ETAC 27.24

*** FIXED REFERENCE VECTORS 1950.0 ECLIPTIC ***

	X	Y	Z
SCAN PLATFORM	A 0.92669697	0.35691531	-0.11766106
REFERENCE COORDINATES	B -0.14794856	0.05867573	-0.98725293
	C -0.34546183	0.93229208	0.10717973
MARS-CANOPUS	C -0.06034372	0.23724161	-0.96957467
MARS-SUN	Z -0.22933410	0.97299643	0.02614933
MARS-EARTH	E 0.43007837	0.90086194	0.05899433
MARS-CENTERED	M1 -0.09811451	-0.99500078	-0.01862760
REFERENCE COORDINATES	M2 0.89311749	-0.07978033	-0.44269205
	M3 0.43899282	-0.06007115	0.89668020
INCOMING ASYMPTOTE	S -0.12456538	-0.98625368	0.10856867
MARS PERIAPSIS	RC -0.94834586	0.02170336	0.05323939

*** TIME-VARYING TRAJECTORY PARAMETERS ***

HR MIN SEC	RS 860567.83	VE 7.21	GA -89.50	DXM 0.10	LAS -6.05	COP 159.16	COD 157.67
-33 2 59.942	HS 857174.42	VF 0.06	CP 158.95	DCM -0.01	LOS 44.32	KAP 110.96	KAD 111.69
JULY 29 1969	RP 859720.46	WR -7.21	KP 111.11	PER 49.80	LAI -7.80	DXP 0.04	DXO 0.32
20 15 54.223	RD 841331.18	TA -95.74	TU 0.23	IPV 88.23	LOZ 65.77	DCP 0.60	DCD -0.88
		AL 179.50	CL 158.33	ESP 158.89	CSP 109.40	LOP 319.96	LOD 78.38
			LATI -20.2		LONI 84.0		

*** MARS - SPACECRAFT VECTOR 1950.0 ECLIPTIC ***

RX 0.11587609	RY 0.98735286	RZ -0.10819911
*** SPACECRAFT - SUN VECTOR 1950.0 ECLIPTIC ***		
Z1 -0.23066577	Z2 213665850.0	Z3 0.97266707
*** MARS - SATELLITE VECTORS 1950.0 ECLIPTIC ***		
PHOBOS 0.89871169	-0.05507687	-0.43506765
DEIMOS -0.36237613	0.90293720	0.23105836

*** SCIENCE INSTRUMENT DATA ***

INSTRUMENT	N	DC	PLATFORM	CONE	158.56100	CLOCK	110.84400	TWIST	-0.06000
TV-B	2	0.008	0.031	0.000	0.012	0.010	1.000	158.56931	110.92761

*** INSTRUMENT REFERENCE VECTORS 1950.0 ECLIPTIC ***

N	X	Y	Z	X	Y	Z	X	Y	Z
2	0.92717794	-0.14630283	-0.34487212	0.35669960	0.05912828	0.93234606	-0.11601290	-0.98746655	0.10700850

*** MARS - OPTIC PATH INTERCEPT VECTORS 1950.0 ECLIPTIC ***

N	1	2	3	4	5	6	7	8
PT	0	1	2	3	4	5	6	7
X	-0.92687171	-0.32925121	0.47643107	-0.95568996	0.07573958	0.89145587	-0.5352785	0.39075479
Y	0.08490209	-0.05381009	-0.13439503	0.15185879	0.91151106	-0.13907255	0.16903558	0.06318745
Z	-0.36601575	-0.94244216	-0.86848715	0.25130691	-0.40424142	-0.43085542	0.81496298	0.91781929

** NON-INTERCEPTING OPTIC PATHS **

PT	L	M	TALT	RT	TSR	SSSR	TIN	STS	DEC	RA	PSV
0	-1	-1	10401.72	13795.12	860457.25	847743.01	73.35	14.80	6.41	264.15	0.92
1	0	-1	5807.80	9201.20	860518.63	852010.44	90.09	21.44	6.90	262.83	0.61
2	1	-1	10791.35	14184.75	860450.91	847381.23	105.30	14.16	6.65	263.49	0.94
3	-1	0	6940.37	10333.77	860505.78	850958.04	67.98	2.28	5.87	262.45	0.69
5	1	0	7454.52	10847.92	860499.45	850480.35	110.64	1.99	5.39	263.77	0.72
6	-1	1	9154.35	12547.75	860476.34	848901.39	71.70	12.68	6.39	262.64	0.84
7	0	1	3803.81	7197.21	860537.73	853873.06	90.24	21.44	6.14	263.30	0.48
8	1	1	9581.47	12974.87	860470.01	848504.72	106.83	12.29	5.90	263.96	0.86

** INTERCEPTING OPTIC PATHS **

PT	L	M	SR	EM	IN	LATP	PSV	PHA	MPS	SHD	SHALT	SHCA	SHPSV
4	0	0	857340.48	17.80	30.87	-22.755	37.6556	0.07	21.43	*****	*****	*****	*****
PT	SPV	ALPHA	SPANG	SUNAN	NORAN	EASAN							
4	17.73	43.59	104.45	149.46	81.17	173.17							

** SURFACE DISTANCE BETWEEN OPTIC PATH INTERCEPT POINTS **

0-1,1-2 3-4,4-5 6-7,7-8 0-3,3-6 1-4,4-7 2-5,5-8 0-4,4-8 1-3,5-7 1-5,3-7

Figure 7. Sample Printout of PEGASIS Data

GEOCENTRIC

ECLIPTIC COORDINATES

X	-40672893	08	Y	-84554501	08	Z	-56859379	07	DX	.10018243	00	DY	-.16979509	02	DZ	.34717637	00
R	.34000413	08	DEC	-.34473489	01	RA	.24431124	03	V	.16983353	02	PTH	.63575236	02	AZ	.80330551	02
Q	.94000412	08	LAT	-.24472072	02	LON	.35064540	03	VE	.62312838	04	PTE	.13984385	00	AZE	.26999861	03
XS	-.89773469	08	YS	.12249193	09	ZS	-.56169999	04	DXS	-.23530421	02	DYS	-.17496248	02	DZS	-.18928647	-02
XM	.26098750	06	YM	-.24719505	06	ZM	-.18565561	05	DXM	.77570961	00	DYM	.76720775	00	DZM	.78354488	-01
XT	-.40772613	08	YT	-.85404184	08	ZT	-.55928252	07	DXT	.99812068	00	DYT	-.98697963	01	DZT	-.43547279	00
RS	.15186588	09	VS	.29322396	02	KM	.35995077	06	VM	.10938339	01	RT	.94802748	08	VT	.99296890	01
GEU	-.24617253	02	ALT	.93934040	08	LQS	.23734152	03	RAS	.12861899	03	RAM	.31994793	03	LDM	.68676461	02
DUT	.39500000	02	DT	.75800000	04	DK	.15208925	02	SHA	.82983777	08	DES	-.18716566	02	DEM	-.18696993	02
CCL	.93854017	02	MCL	.18002213	03	TCL	.24964238	02									

HELIOCENTRIC

ECLIPTIC COORDINATES

X	.49100576	08	Y	-.20706643	09	Z	-.56803200	07	DX	.23630603	02	DY	.51683941	00	DZ	.34528344	00
R	.21286464	09	LAT	-.15291266	01	LON	.28334111	03	V	.23638776	02	PTH	.12059639	02	AZ	.88817056	02
XE	.89773469	08	YE	-.12249193	09	ZE	.56169999	04	DXE	.23530421	02	DYE	.17496348	02	DZE	-.18928647	-02
XT	.49000857	08	YT	-.20789512	09	ZT	-.55872080	07	DXT	.24528541	02	UYT	.76265542	01	DZT	-.43736577	00
LIE	-.21191611	-02	LOE	.30523742	-03	LTI	-.14984141	-01	LJT	.28326248	-03	RST	.21366585	-04	VST	.25690561	-02
EPS	.39037539	02	ESP	.22944725	02	SEP	.11801773	03	EPM	.20923967	00	EMP	.10767731	03	MEP	.72113647	02
MPS	.39246112	02	MSP	.22968425	02	SMP	.11778546	03	SEM	.16927133	03	EMS	.10705923	02	ESM	.26169577	-01
EPT	.15870599	03	ETP	.21105131	02	TEP	.18897063	00	TPS	.15855198	03	TSP	.84510203	-01	STP	.21363641	02
SET	.11818858	03	STE	.33793072	02	EST	.23021249	02	RPM	.93890489	08	RPT	.86056785	05	SPN	.39033651	02
SAC	.69539643	-10															
GCE	.26616598	-03	GCT	-.11111022	-03	SIP	.15832604	03	CPT	.10939969	03	SIN	.10917376	-03			
REP	.94000416	08	VEP	.15983354	02	CPE	.82608771	02	CPS	.77361254	02						

AREOCENTRIC

ECLIPTIC COORDINATES

X	.99719242	05	Y	.94969412	06	Z	-.93112675	05	DX	-.89793766	00	DY	-.71097147	01	DZ	.78264917	00
R	.86056782	06	DEC	-.62115125	01	RA	.83306365	02	V	.72088054	01	PTH	-.89497365	02	AZ	.7562216	02
ALT	.85717444	06	SHA	-.31349271	06	ALP	.15948529	03	DR	-.72085288	01	DP	.42055922	-05	ASU	.22592989	00
HGE	.32096246	03	SVL	.88777342	01	HNG	.16339622	03	SIA	.15848006	03	ED	.24393554	02			
SAC	.69539643	-10															

AREOCENTRIC EQUATORIAL COORDINATES

X	-.85348385	06	Y	.52585403	05	Z	-.90693894	05	DX	.71476696	01	DY	-.58199357	00	DZ	.73415127	00
R	.86056782	06	DEC	-.50495462	01	RA	.17580604	03	V	.72088052	01	PTH	-.89497965	02	AZ	.11399624	03
R	.86056781	06	LAT	-.60495463	01	LON	.44212626	02	VP	.61028744	02	PTP	-.67834380	01	AZP	.26997571	03
RAE	.16305819	03	DEE	.10814042	02	RAS	.19725731	03	DES	-.77951476	01	LQE	.31464773	02	LDS	.65663897	02

AREOCENTRIC CONIC

EPOCH OF PERICENTER PASSAGE		236446476047 203612452200 J.D.=2440433.72146025 JULY 31,1969 04 18 54.165															
SMA	-.82557547	03	EC	.91973608	01	B	.75475676	04	SLR	.69006494	05	APD	.00000000	00	RCA	.67672926	04
VH	.72018997	01	C3	.51867360	02	C1	.54358874	05	TFP	-.11897994	06	TF	.511172935	01	LTF	.1143495	01
TA	-.95739863	02	MTA	.35242133	-02	EA	-.31079921	03	MA	-.59468458	05				TF1	.37402209	01
ZAE	.15933282	03	ZAP	.15815829	03	ZAC	.10937376	03	DEF	.12484365	02	IR	.41374121	04	GP	.72556896	01

ALL VECTORS REFERENCED TO ECLIPTIC PLANE

X	.99719242	05	Y	.94969412	06	Z	-.93112675	05	DX	-.89793766	00	DY	-.71097147	01	DZ	.78264917	00
INC	.67398920	01	LAN	.15165808	03	APF	.27241710	02	MX	-.99160376	00	MY	.12104516	00	MZ	.42626065	-01
MX	.55184054	-01	MY	.10235130	-00	MZ	.99308918	00	PX	-.99822099	00	PY	.21702735	-01	PZ	.53232520	-01
QX	-.16133575	-01	QY	-.99450831	00	QZ	.10339407	00	RX	-.13604314	-01	RY	-.10771294	00	RZ	-.99408892	00
BX	-.99067496	00	BY	.12971427	00	BZ	.41681148	-01	TX	-.99211813	00	TY	.12530608	00	TZ	.00000000	00
SXI	-.12456538	00	SYI	-.98625364	00	SZI	.10856867	00	DAI	.62328122	01	RAI	.26280157	03			
SXU	.32489505	-01	SYU	-.93097273	00	SZU	.34943697	-01	DAU	.55660802	01	RAU	.27533208	03			
ETE	.27237125	02	ETS	.15992907	03	ETC	.26455019	03									

BTC .75409301 04 BRC -.31845364 03 B .75475676 04 THA .35759693 03 T VECTOR IN ECLIPTIC PLANE

Figure 7 (cont.) - Sample Printout of PEGASIS Data

TABLE 3

DEFINITIONS OF TRAJECTORY PROGRAM
PARAMETERS AND PEGASIS PARAMETERS

The definitions of selected integrated trajectory program parameters and PEGASIS parameters thought to be of general interest are listed here. A complete list of all output parameters can be found in reference 5 for the integrated trajectory parameters. Reference 3 contains a complete description of all PEGASIS output quantities; reference 4 describes the structure and functions of the integrating trajectory program SPACE; and reference 1 explains the PEGASIS program functions.

Selected Integrated Trajectory Outputs		
Parameter	Line No.	Definition
JD	-	Julian date of picture epoch
Geocentric Equatorial Block		
X, Y, Z	1	1950.0 vernal equinox Cartesian position, km
DX, DY, DZ	1	1950.0 vernal equinox Cartesian velocity, km/sec
R	2	Geocentric range to spacecraft, km
DEC	2	Declination of spacecraft, deg
RA	2	Right ascension of spacecraft, deg
LAT	3	Geocentric latitude of spacecraft, deg
LON	3	Earth-fixed longitude of spacecraft, deg
Heliocentric Ecliptic Block		
X, Y, Z	1	1950.0 vernal equinox Cartesian position, km
DX, DY, DZ	1	1950.0 vernal equinox Cartesian velocity, km/sec
R	2	Heliocentric range to spacecraft, km
LAT	2	Celestial latitude of spacecraft, deg
LON	2	Celestial longitude of spacecraft, deg
TPS	8	Target-probe-sun angle (cone angle of Mars as viewed from spacecraft), deg
GCT	11	Clock angle of Mars as viewed from spacecraft, deg

TABLE 3 (continued)

Parameter	Line No.	Definition
Areocentric Ecliptic Block		
X, Y, Z	1	1950.0 Mars-centered vernal equinox Cartesian position, km
R	2	Areocentric range to spacecraft, km
ASD	5	Angular semi-diameter of Mars as viewed from spacecraft, deg
Areocentric Equatorial Block		
X, Y, Z	1	1950.0 Mars equatorial Cartesian position, km
LAT	3	Mars-centered latitude of spacecraft, deg
LON	3	Mars-centered longitude of spacecraft, deg
Areocentric Conic		
SMA	1	Semi-major axis, km
ECC	1	Eccentricity
RCA	1	Periapsis, km
VH	2	Hyperbolic excess speed, km/sec
ZAC, ZAE, ZAP	4	Angle between incoming asymptote at Mars and Mars-Canopus, Mars-Earth, Mars-Sun vectors, respectively, deg
DAI, RAI	10	Celestial latitude, longitude of incoming asymptote, deg
ETC, ETE ETS	12	Angle between T and projection of Canopus-Mars, Earth-Mars, Sun-Mars vectors, respectively, deg
BTC, BRC	13	T, R components of aiming vector B
Selected PEGASIS Output Quantities Defined		
Parameter Symbol	Units	Description
Time-Varying Trajectory Parameters		
GMT	Hr min sec	Time at spacecraft for which calculation applies

Table 3 (continued)

Parameter Symbol	Units	Description
Time-Varying Trajectory Parameters (continued)		
HS VT, VR	km km/sec	Spacecraft altitude above planet surface Tangential, radial component of spacecraft inertial velocity relative to target
LAS	deg	Latitude of sub-spacecraft point in planet coordinates
LOS	deg	Longitude of sub-spacecraft point
LAZ	deg	Latitude of sub-solar point
LOZ	deg	Longitude of sub-solar point
TU	deg	Angular semi-diameter of planet as seen from spacecraft
LOP, LOD	deg	Areocentric longitude of Phobos, Deimos
Time-Varying Instrument Parameters		
PT	none	Serial location of point in instrument array
SR	km	Slant range along optic path from spacecraft to planet surface
LATP	deg	Latitude of optic ray intercept point on surface
LONP	deg	Longitude of optic ray intercept point on surface
LATI	deg	Latitude of path parallel to optic ray but through planet center
LONI	deg	Longitude of path parallel to optic ray but through planet center
EM	deg	Angle between anti-optic ray and surface normal at intercept point
IN	deg	Angle between anti-optic ray and sun direction at intercept point
SUNAN	deg	Angle measured clockwise in image plane from the positive cone direction to conical projection of tangent to great circle between surface intercept point and sub-solar point
NORAN	deg	Same as SUNAN, except measured to sub-north-pole point
EASAN	deg	Same as SUNAN, except referenced to circle of latitude easterly direction

Table 3 (continued)

Parameter Symbol	Units	Description
Time-Varying Instrument Parameters (continued)		
PHA	deg	Phase angle between incident sunlight and optic path
TALT	km	Altitude of optic ray "tangent" point for non-intercepting ray
TSR	km	Slant range from spacecraft to optic ray tangent point for non-intercepting ray

Definition of Reference Vectors and Coordinates*

1. Mars-Centered Reference Coordinates

A set of Mars-centered inertial coordinates where M1 is toward the Martian vernal equinox, M3 is along the Martian north pole and M2 completes the right-handed set. These coordinates are then rotated in PEGASIS through the hour angle of the zero meridian for each picture, and, when M1 is rotated, M2 defines Mars-fixed longitude, and M3 defines areocentric latitude.

2. Scan Platform Reference Coordinates

Coordinates rotated through the Euler rotations [3,clock], [2,cone], [3,twist] from a spacecraft-Sun spacecraft-Canopus reference. These coordinates inertially describe the position of the scan platform, at the given shutter time. Important note -- at the time of publication of reference 2, from which these definitions were extracted, the author noticed that these Platform Reference Coordinates are transposed in the PEGASIS output. Therefore, the Z component of A is found as the X component of C, etc.

3. Instrument Reference Vectors

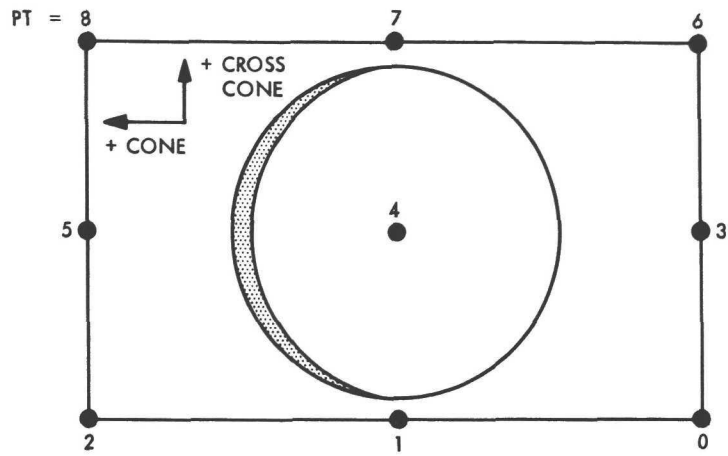
A set of inertial instrument-fixed coordinates which are obtained by a (2, -1, 3) rotation from the ABC platform coordinates, through the cone, cross-cone, and twist angle offsets of the instrument on the scan platform. C1 is along the positive cone direction, C2 along the positive cross-cone direction, and C3 defines the optic axis of the instrument.

*Note that the Cartesian reference coordinates output in PEGASIS are defined with respect to the mean earth equator and equinox of 1950.0.

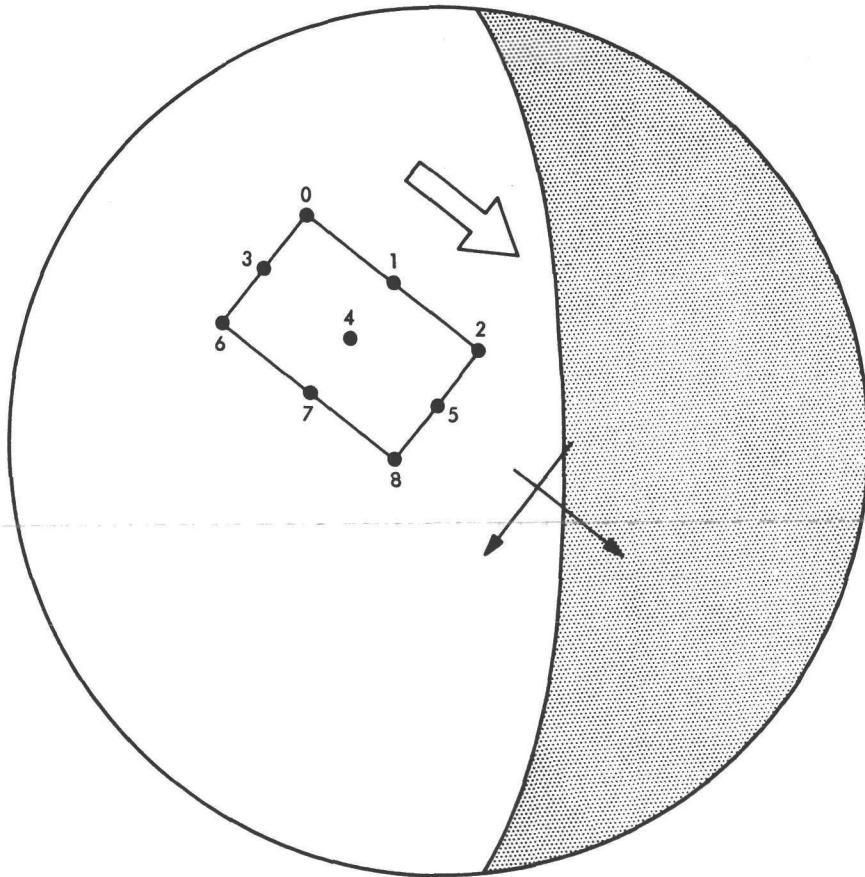
Definition of Reference Vectors and Coordinates (continued)

4. Mars-Optic Path Intercept Vectors

The vector sum of the optic path vector for each point defining the image plane of an instrument and the Spacecraft-Mars vector. The optic path either strikes the planet, or is tangent to a planet-centered sphere.



FAR-ENCOUNTER ORIENTATION OF
IMAGE PLANE COORDINATES



NEAR-ENCOUNTER ORIENTATION OF
IMAGE PLANE COORDINATES

Figure 8. Orientation of Image Plane Coordinates Used for PEGASIS

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The Mariner 6 and 7 pictures may also be viewed at NSSDC.

Inquiries about or requests for photographs from U.S. scientists should be addressed to:

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Goddard Space Flight Center
Greenbelt, Maryland 20771

Telephone: (301-982-6695)

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World Data Center A for Rockets and Satellites
Code 601
Goddard Space Flight Center
Greenbelt, Maryland 20771 U.S.A.

The World Data Center A for Rockets and Satellites is now assisting scientists located outside the United States in acquiring space science data held in U.S. national archives, including the National Space Science Data Center. Since January 2, 1969, it has been located contiguous to NSSDC.

Individuals or organizations that wish to obtain Mariner 6 and 7 maximum discriminability television pictures for purposes other than use in specific scientific research projects or instructional use in college-level science courses should address their requests to:

Public Information Divison
Code FP
National Aeronautics and Space Administration
Washington, D.C. 20546

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1. Campbell, J., "Some General Information on PEGASIS," JPL 10M-312.4, 781, Sept. 14, 1967.
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3. Foster, J., User's Guide to PEGASIS, JPL Document 900-246, July 31, 1969.
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6. Leighton, R. B., et al., "Mariner 6 and 7 Television Pictures; Preliminary Analysis," Science, 166, No. 3901, 49-67, Oct. 3, 1969.
7. "Mariner-Mars 1969, A Preliminary Report," NASA SP-225, Nov. 3, 1969.
8. PEGASIS Plot Program User's Guide, prepared for JPL on contract 952341 by IBM, Federal Systems Division West, Los Angeles, Nov. 15, 1968.

ACKNOWLEDGMENTS

The Data Center wishes to thank the individuals and organizations responsible for the high-quality photographs and supporting data obtained from the Mariner missions.

Arrangements to make these data available to NSSDC were accomplished through the assistance of the principal investigator, Dr. Robert B. Leighton, and of Mr. Andy Collins of the California Institute of Technology and the Mariner-Mars 1969 Television Experiment Team, Jet Propulsion Laboratory.

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Scientists OUTSIDE the United States send order to: WORLD DATA CENTER A ROCKETS AND SATELLITES CODE 601 GODDARD SPACE FLIGHT CENTER GREENBELT, MARYLAND 20771 U.S.A.	Scientists WITHIN the United States send order to: NATIONAL SPACE SCIENCE DATA CENTER. CODE 601.4 GODDARD SPACE FLIGHT CENTER GREENBELT, MARYLAND 20771 U.S.A.
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NAME AND TITLE		POSITION	
DIVISION/BRANCH			MAIL CODE
ORGANIZATION			
ADDRESS			
CITY		STATE	
ZIP CODE OR COUNTRY	TELEPHONE	(Area Code)	(Number) (Extension)

DATA REQUESTED

<input type="checkbox"/> RAW ANALOG: NSSDC ID _____; Mission No. _____; Size* _____; Specific Frames <input type="checkbox"/> (✓) (Fill in below); Complete Set <input type="checkbox"/> (✓)
<input type="checkbox"/> MAXIMUM DISCRIMINABILITY: NSSDC ID _____; Mission No. _____; Size* _____; Specific Frames <input type="checkbox"/> (✓) (Fill in below); Complete Set <input type="checkbox"/> (✓)
<input type="checkbox"/> PHOTOMETRICALLY DECALIBRATED: NSSDC ID _____; Mission No. _____; Size* _____; Specific Frames <input type="checkbox"/> (✓) (Fill in below); Complete Set <input type="checkbox"/> (✓)
<input type="checkbox"/> ALTERNATE CONTRAST: NSSDC ID _____; Mission No. _____; Size* _____; Specific Frames <input type="checkbox"/> (✓) (Fill in below); Complete Set <input type="checkbox"/> (✓)
<input type="checkbox"/> PHOTOMOSAICS: NSSDC ID _____; Mission No. _____; Size* _____; Specific Frames <input type="checkbox"/> (✓) (Fill in below); Complete Set <input type="checkbox"/> (✓)
<input type="checkbox"/> MAXIMUM DISCRIMINABILITY TAPES: NSSDC ID _____; Mission No. _____; Time Coverage _____; Available Computer _____
<input type="checkbox"/> PHOTOMETRIC TAPES: NSSDC ID _____; Mission No. _____; Time Coverage _____; Available Computer _____

INDIVIDUAL FRAMES REQUESTED

ID	FRAME NO.	VERSION	FORM	SIZE*	ADDITIONAL SPECIFICATIONS

*See reverse side of this form.

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APPENDIX A

PHOTOGRAPHIC CATALOG

This appendix consists of proof prints of the enhanced (Maximum Discriminability - Optimal Presentation) photography from the Mariner 6 and 7 missions. Also included are seven mosaics that contain all the near-encounter pictures except for those taken at the terminator.

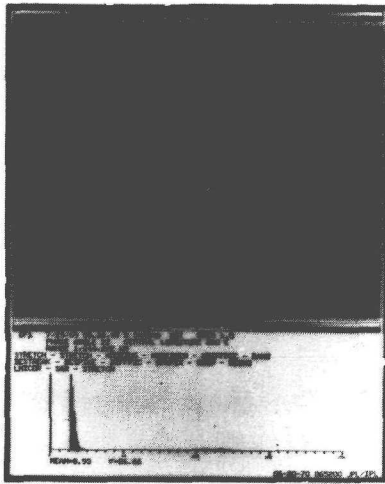
The cataloged photographs have been sorted by mission, encounter, and frame number. For example, a picture labeled 6N20 is the twentieth frame exposed by Mariner 6 in the near-encounter mode. This numbering scheme applies to both Mariner missions. In addition to the frame number identification, the date and time of exposure is given as well as the camera used (A or B), the filter used (green, blue, or red), the shutter direction (top or bottom), and the signal gain (the factor by which the video signal was amplified before it was recorded).

Other parameters listed, as applicable, are phase angle, zenith angle, approximate width of the exposure area, the height of the area, a list of computer programs used in the processing, the central longitude, and the range (i.e., slant range). Most of these parameters are defined in table 3 in the Data Users' Note.

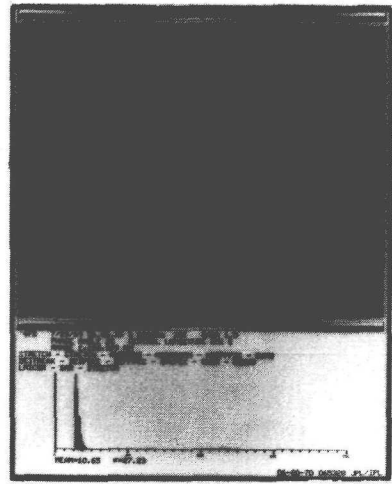
The histogram at the bottom of each picture shows the data number range of the 600,000 pixels (i.e., gray scale range) from 0 to 255 going from left to right. The vertical scale is the number of pixels for that specific data number. The mean is the average value of the data numbers 0 to 255 (or light levels) of all 600,000 pixels. The standard deviation (σ) is a measure of the dispersion of data points around their mean value.

MARINER 6
FAR-ENCOUNTER

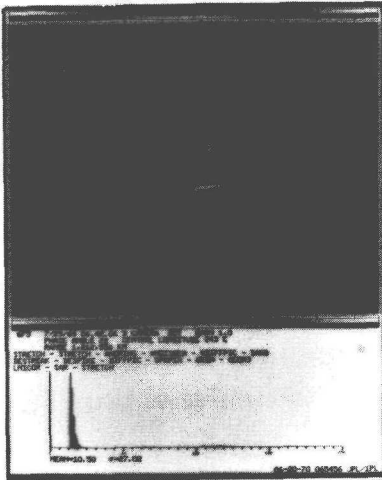
Frames 6F1 through 6F49



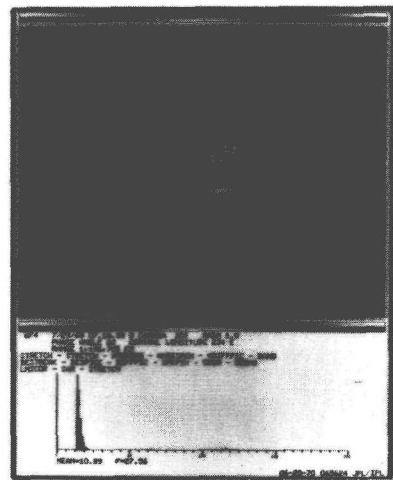
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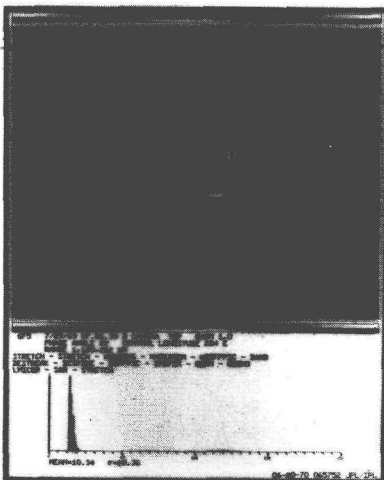
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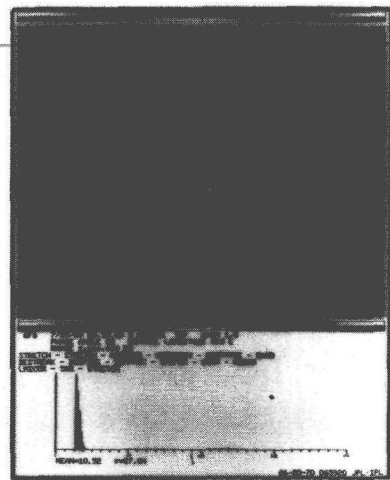
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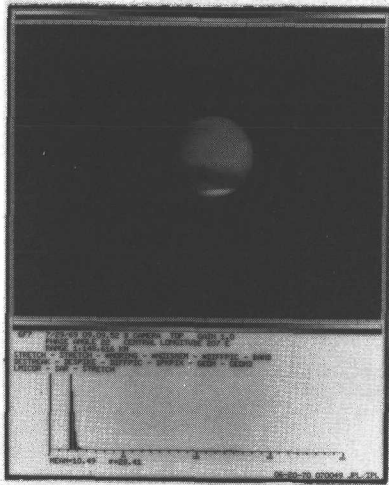
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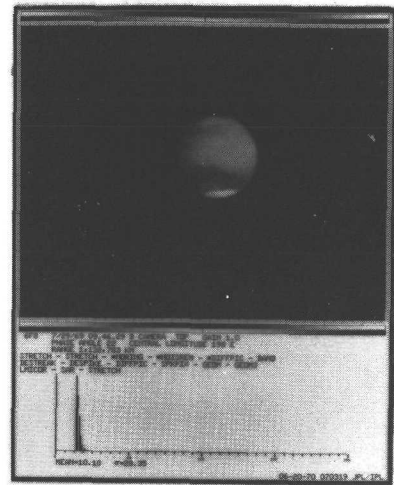
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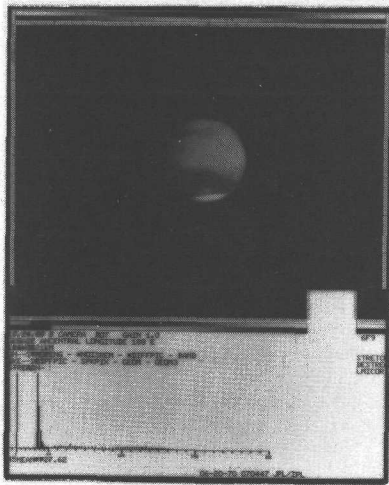
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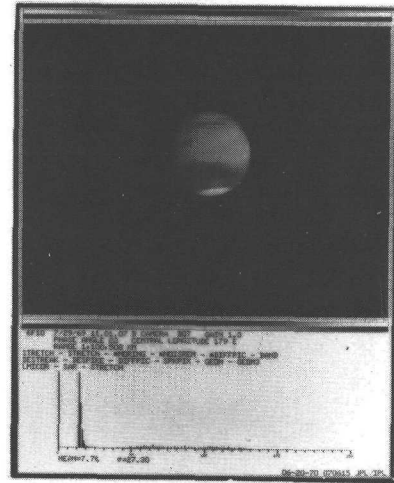
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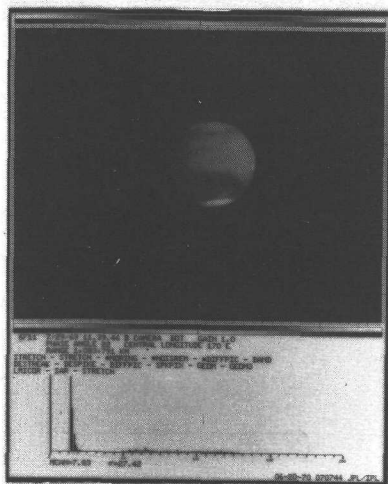
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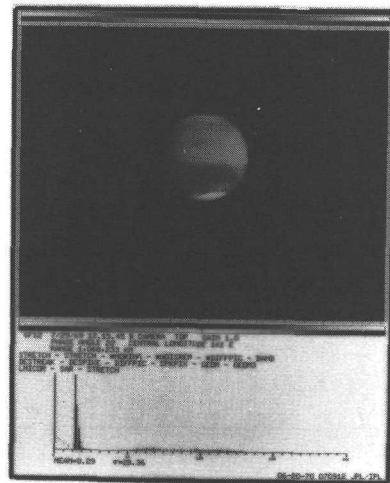
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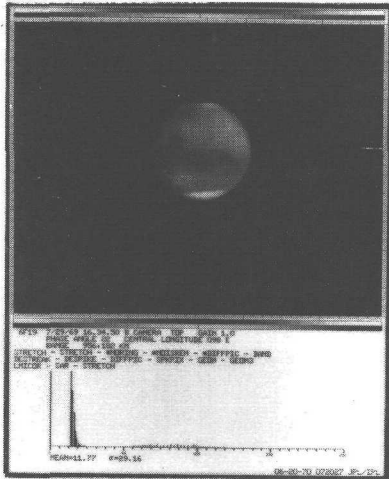
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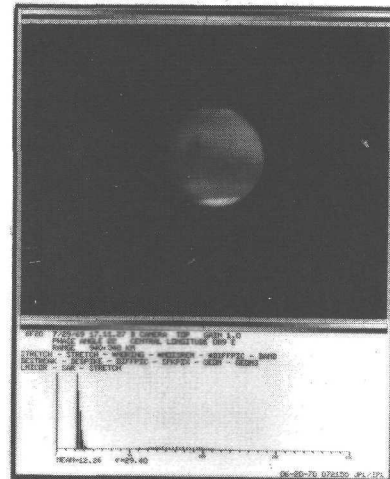
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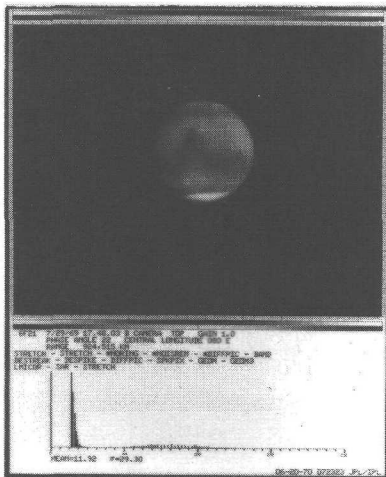
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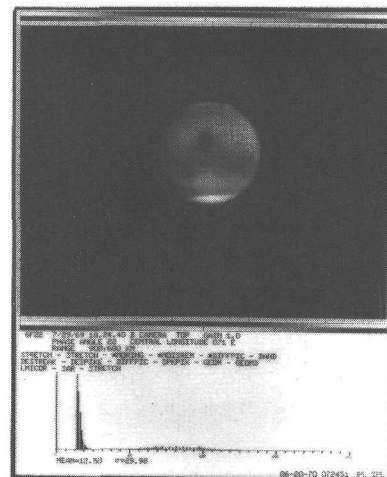
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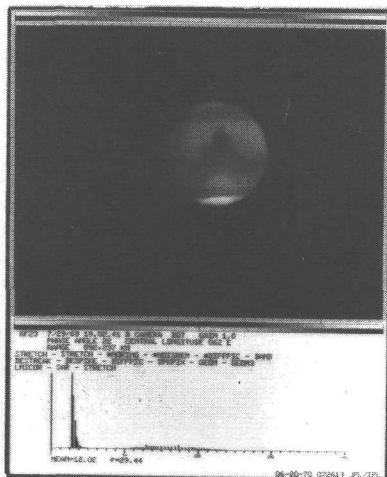
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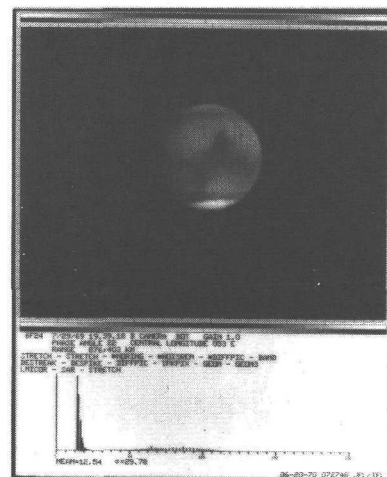
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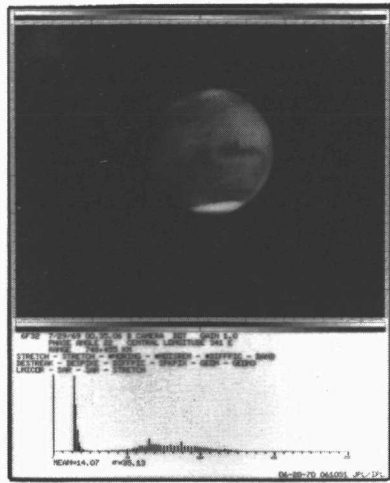
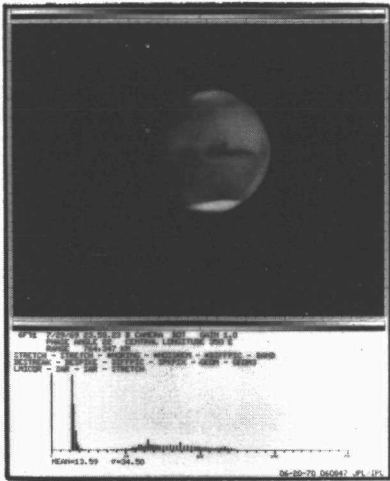
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6F23

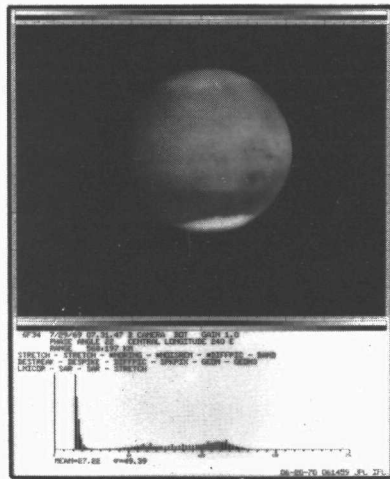
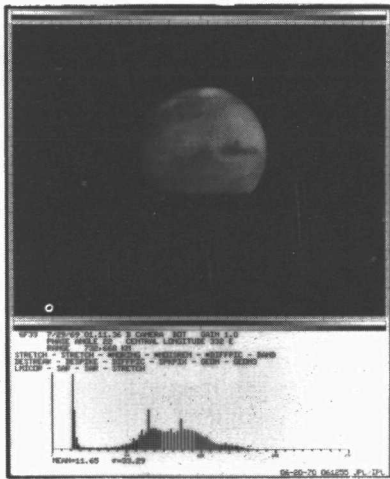


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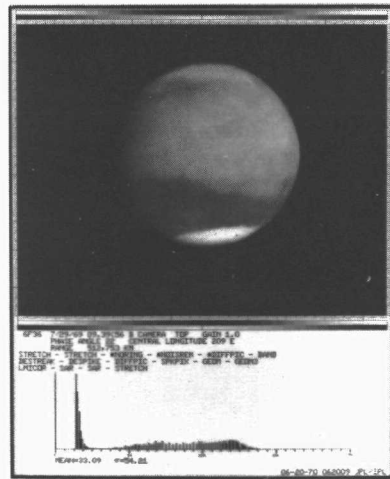
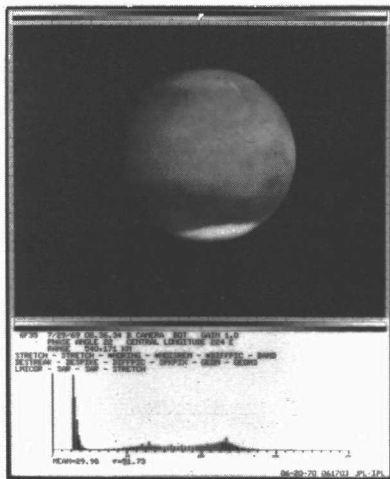
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6F32



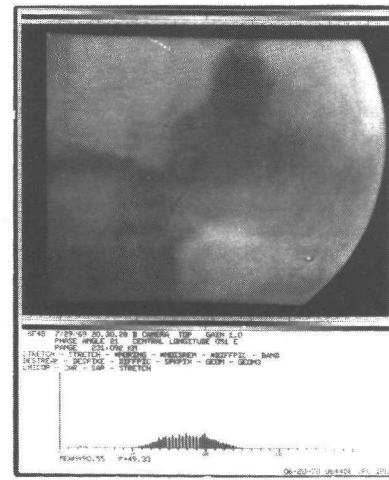
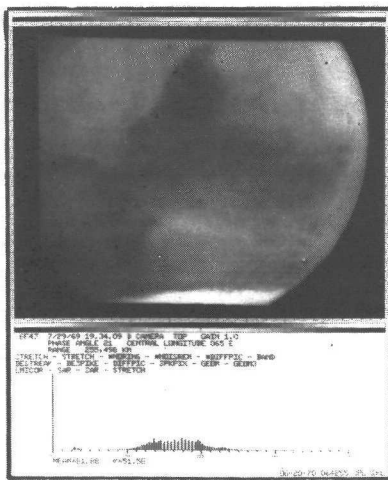
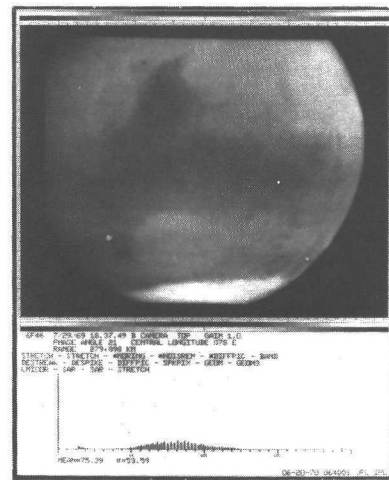
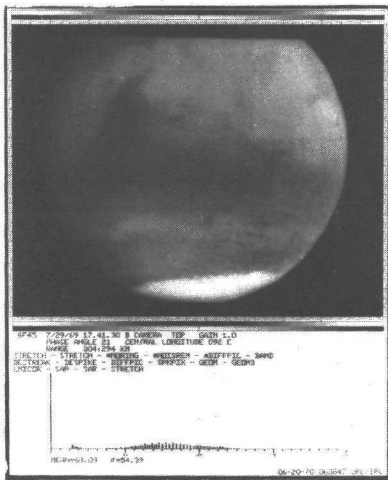
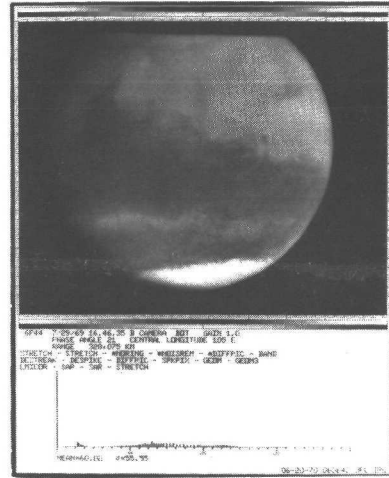
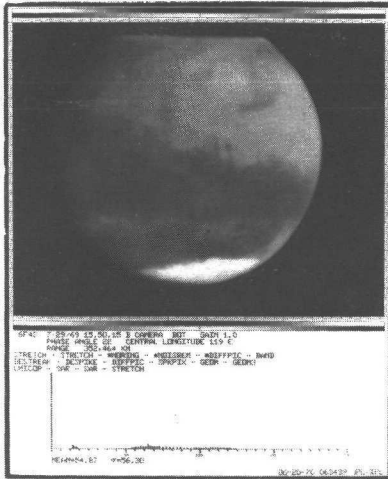
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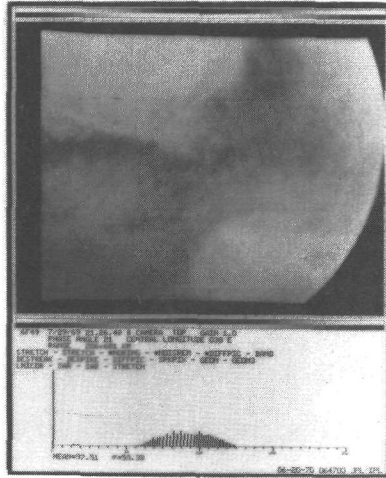
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6F35

6F36

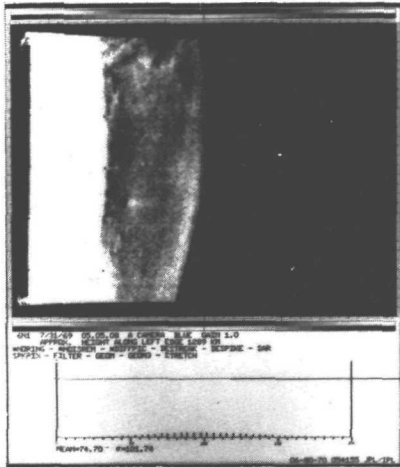




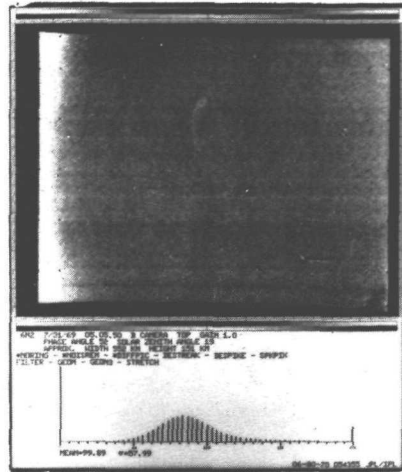
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MARINER 6
NEAR-ENCOUNTER

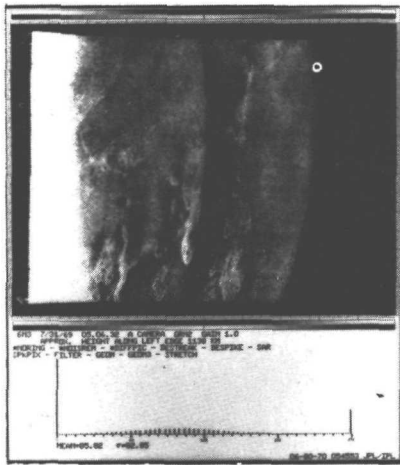
Frames 6N1 through 6N25



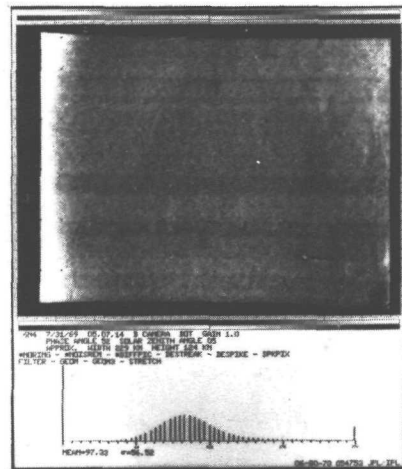
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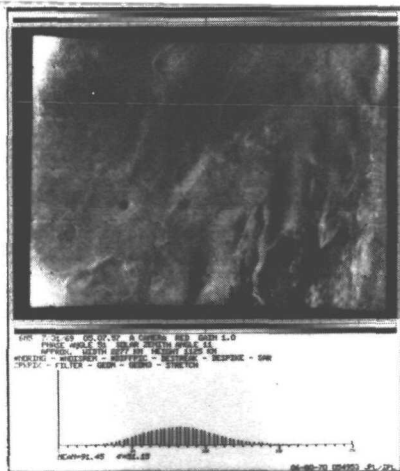
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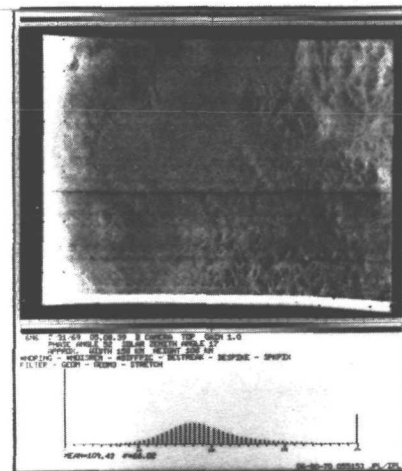
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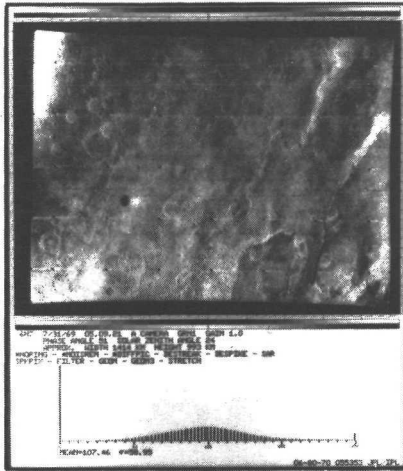
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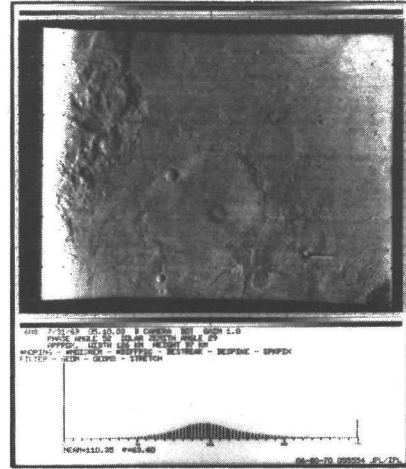
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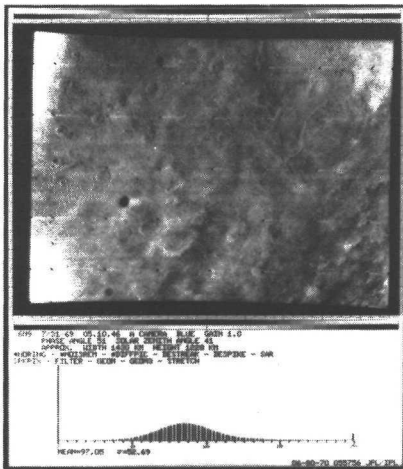
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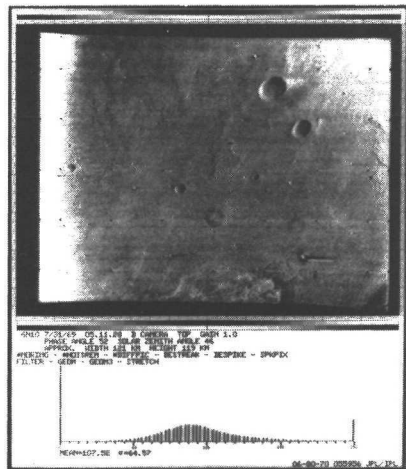
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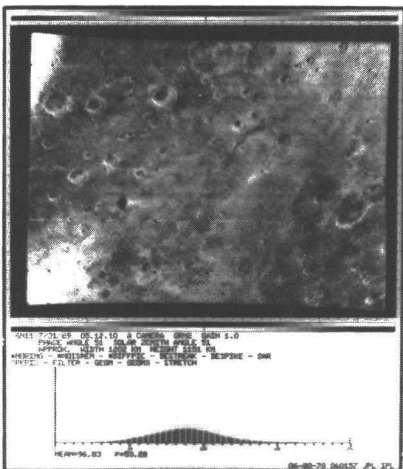
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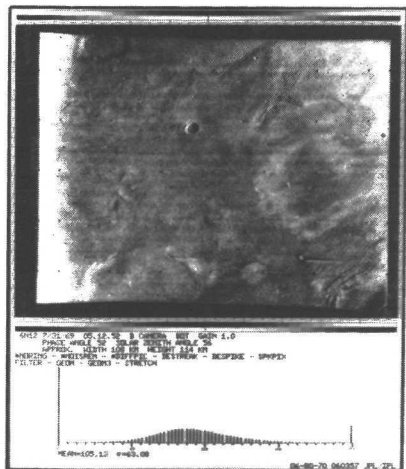
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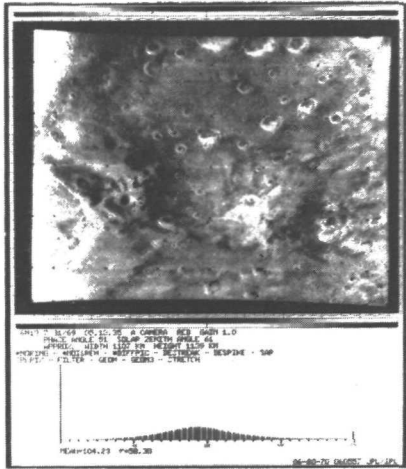
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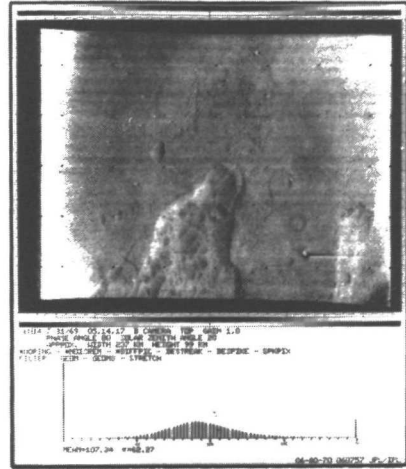
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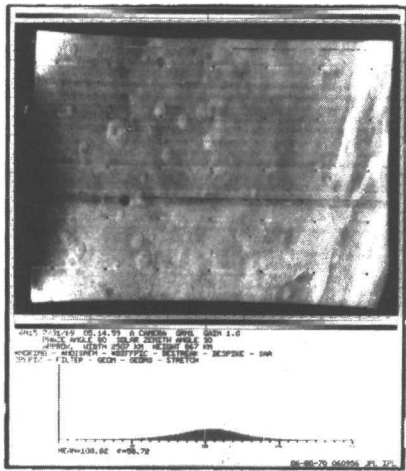
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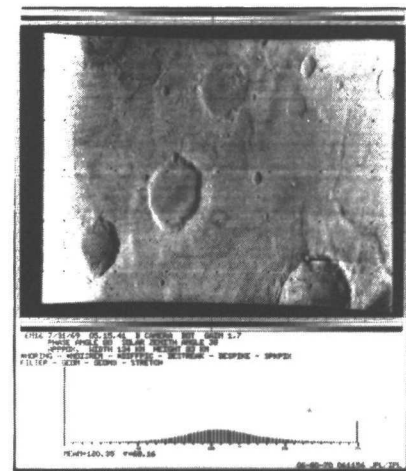
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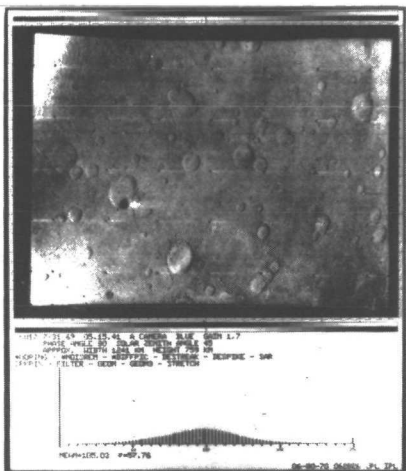
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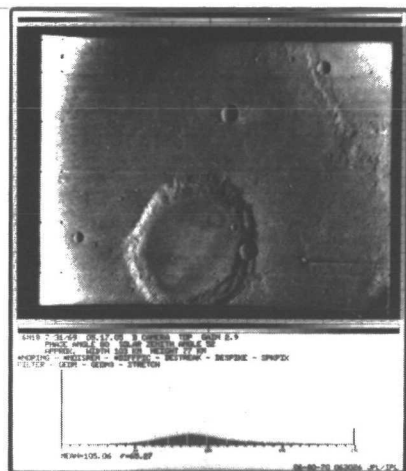
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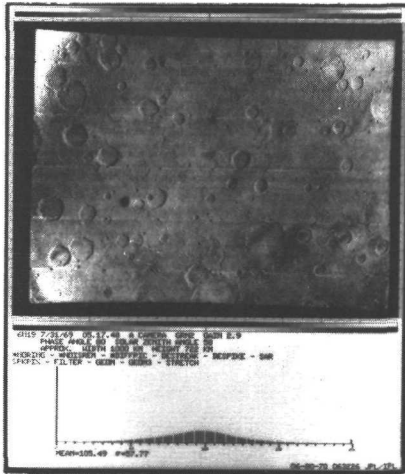
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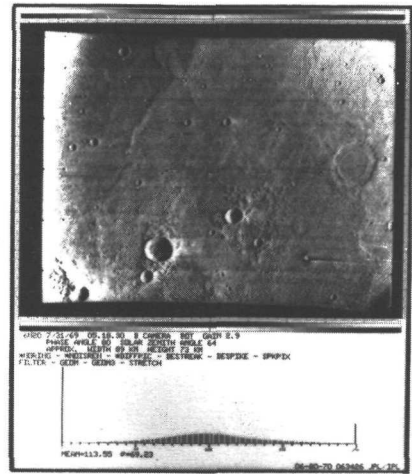
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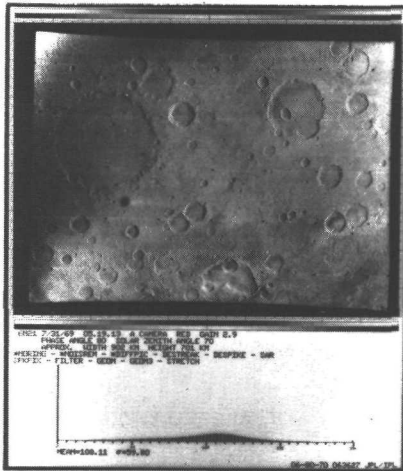
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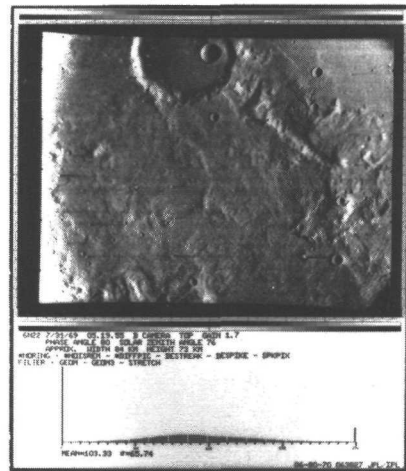
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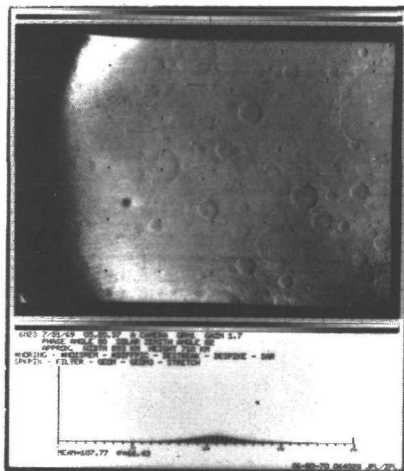
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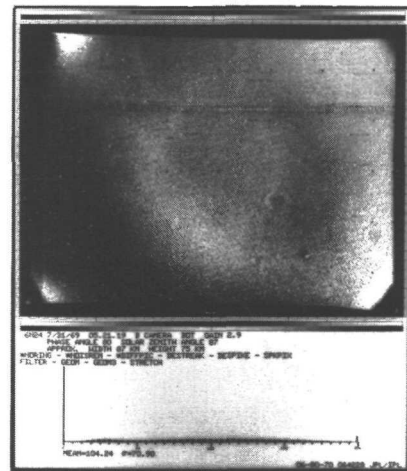
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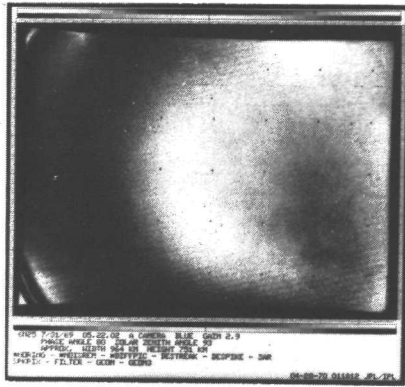
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6N23



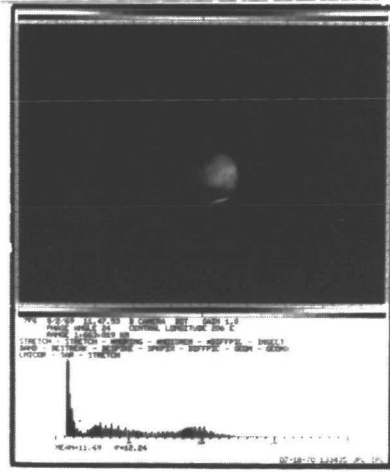
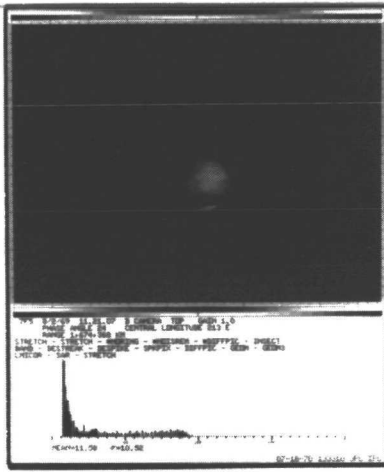
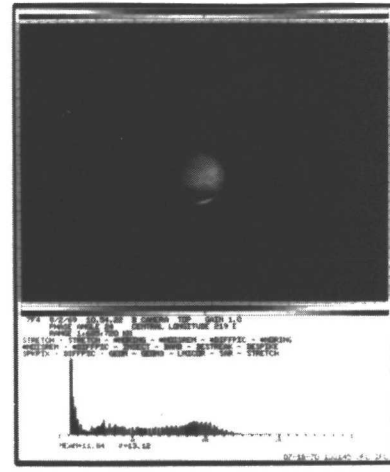
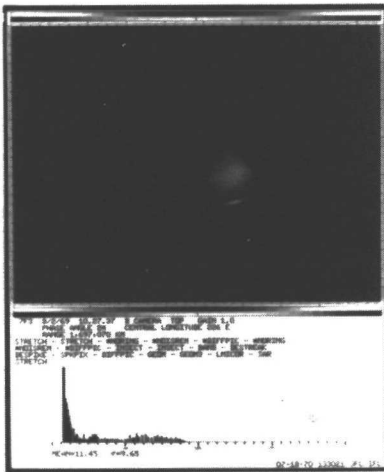
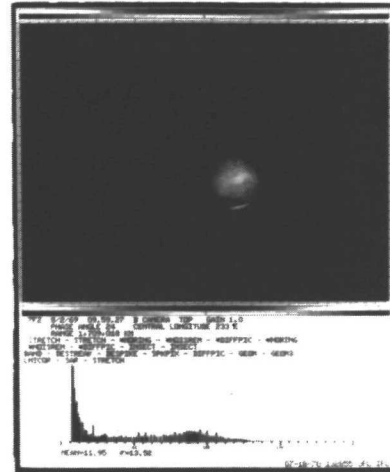
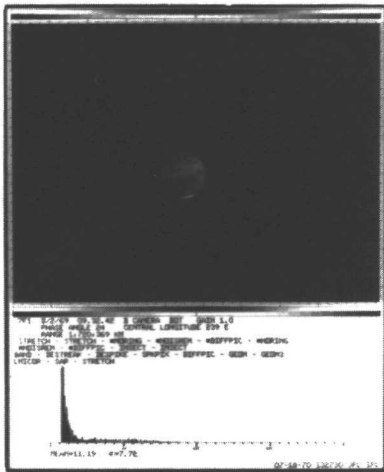
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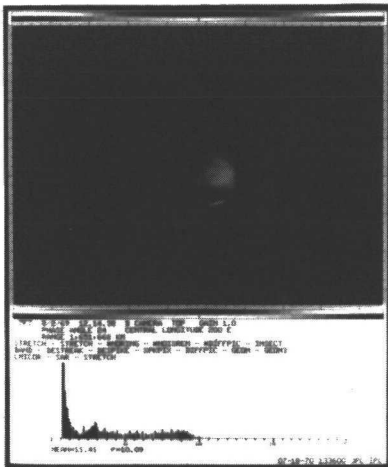


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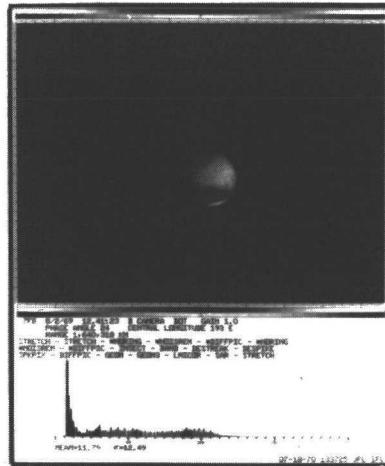
MARINER 7
FAR-ENCOUNTER

Frames 7F1 through 7F93

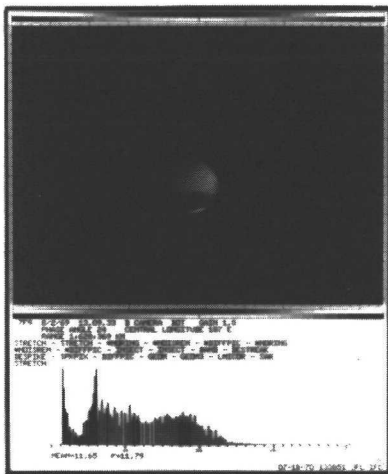




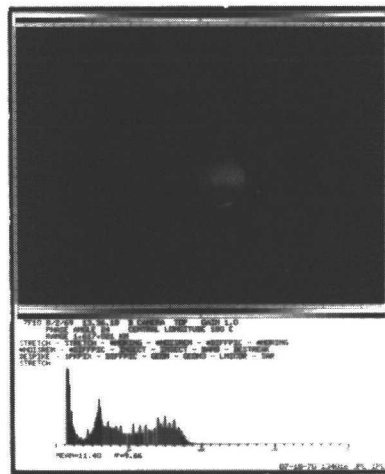
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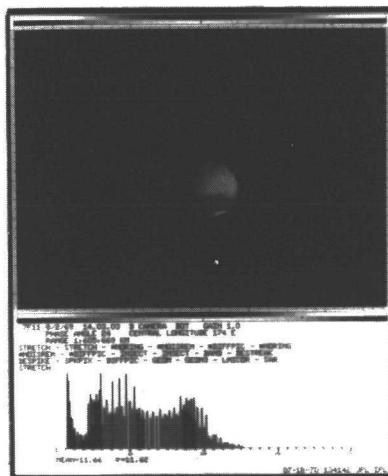
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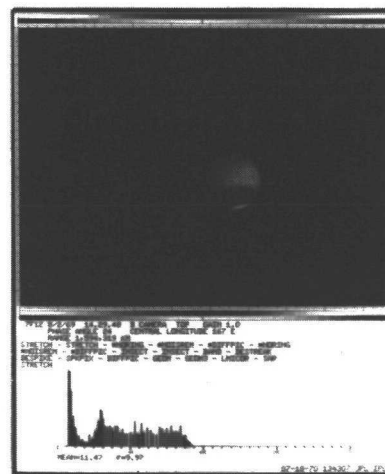
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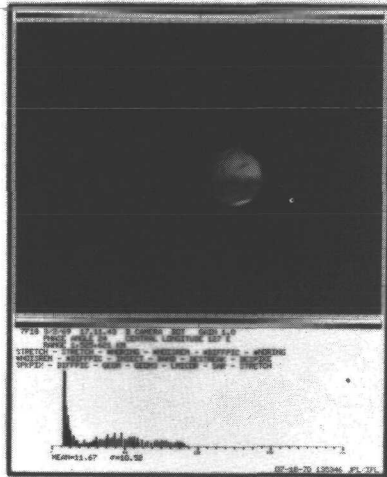
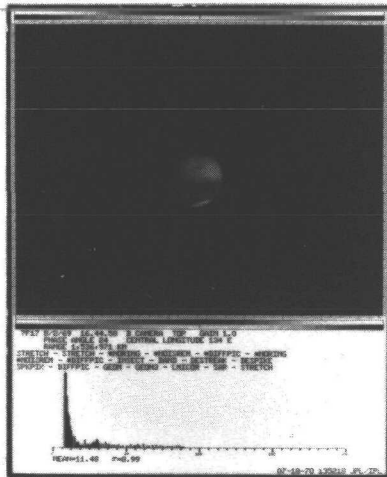
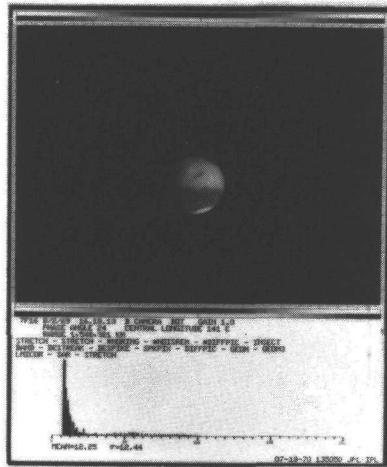
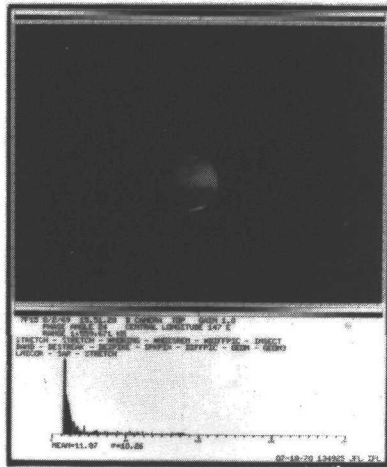
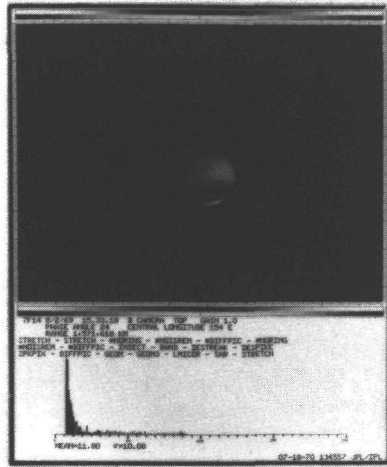
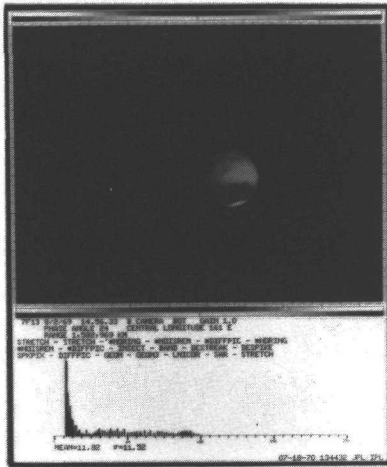
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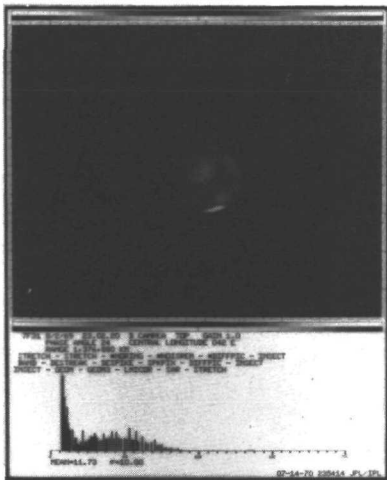


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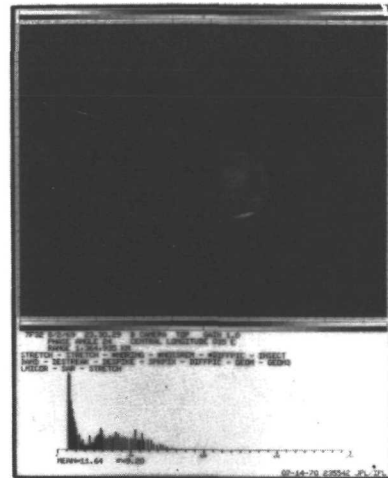


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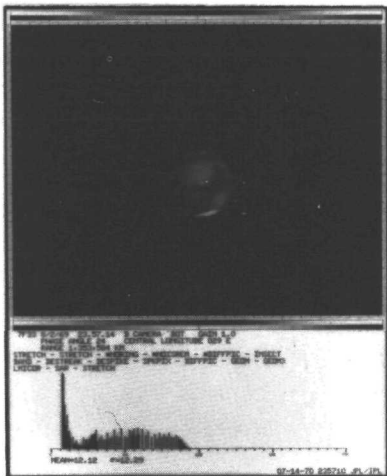




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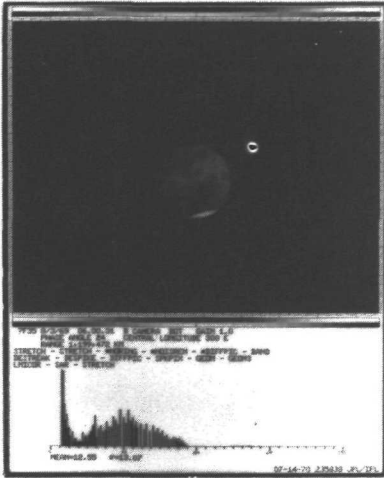


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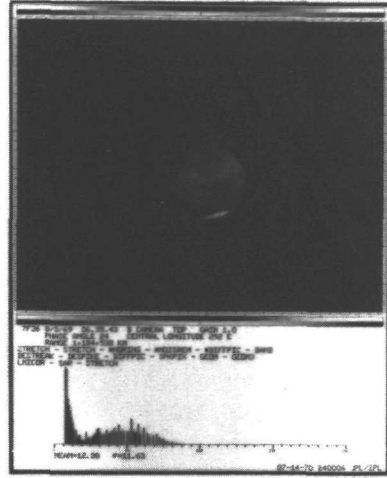


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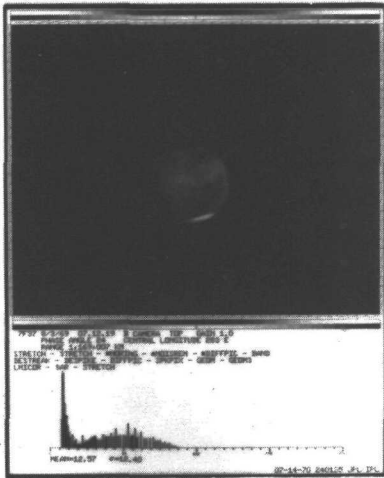
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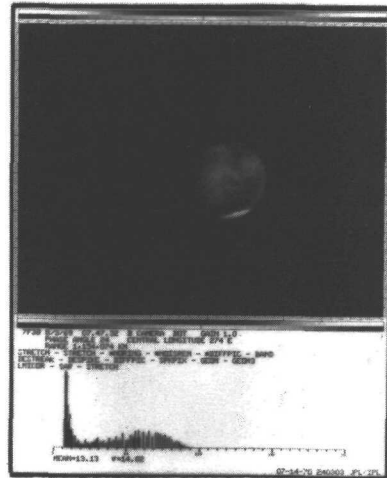
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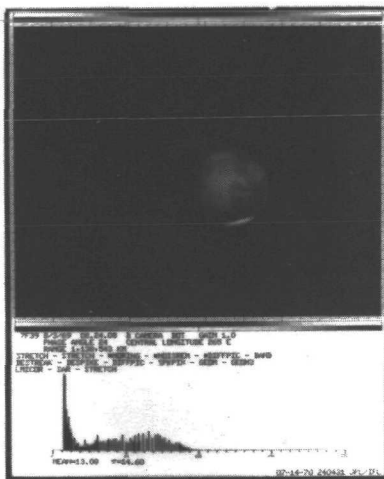
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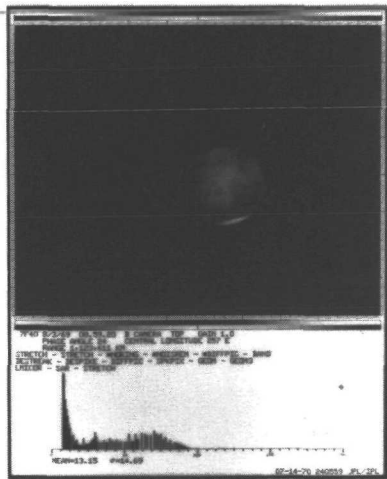
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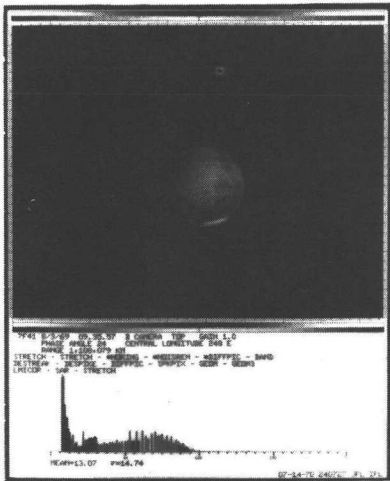
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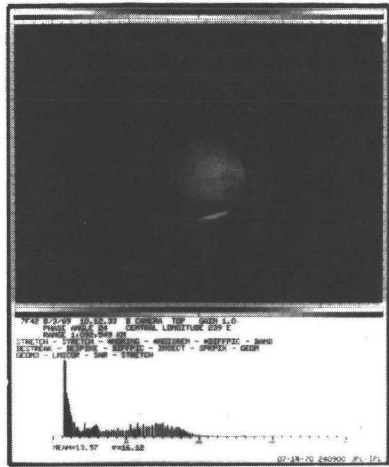
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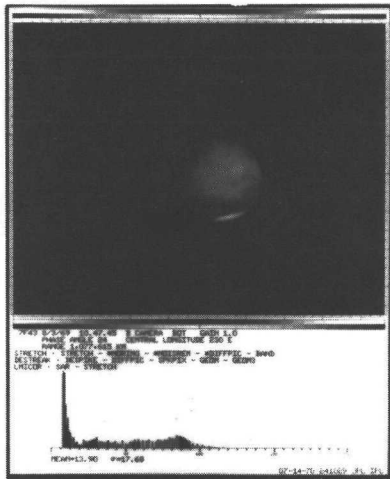
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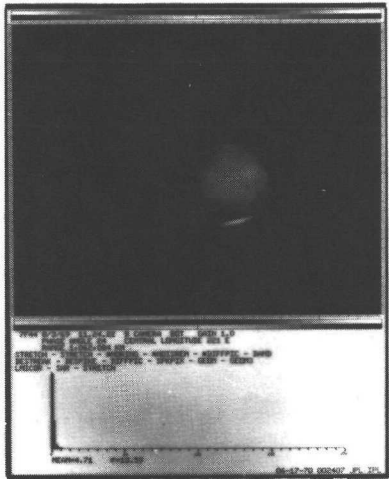
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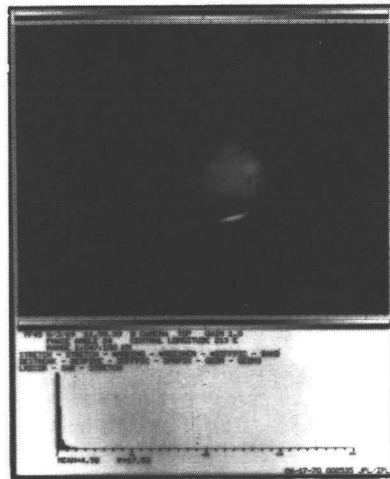
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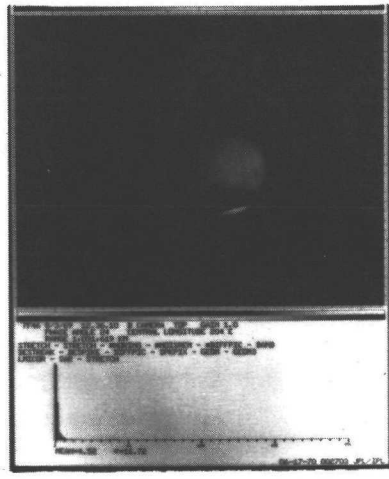
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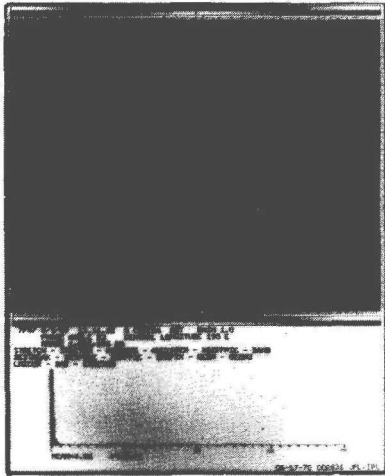
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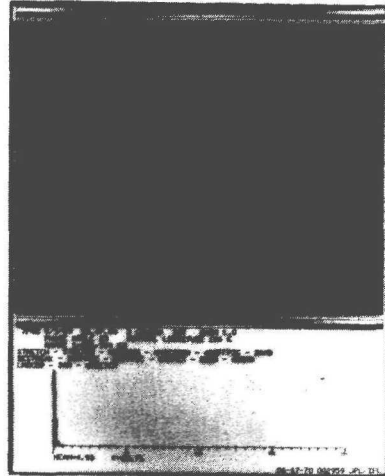
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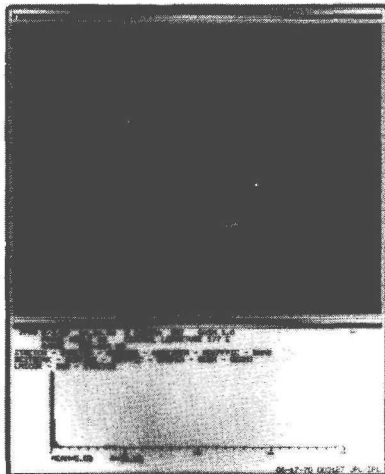
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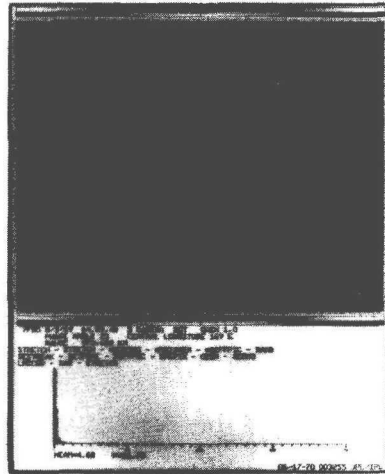
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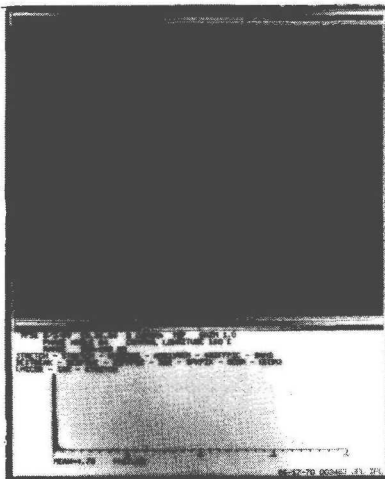
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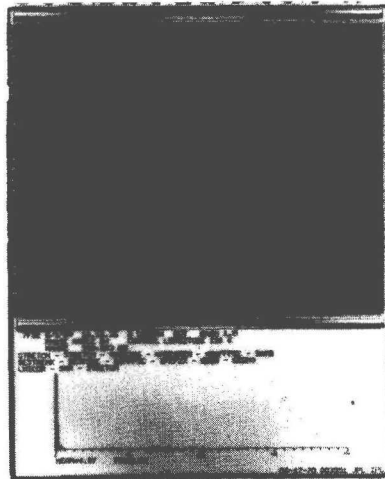
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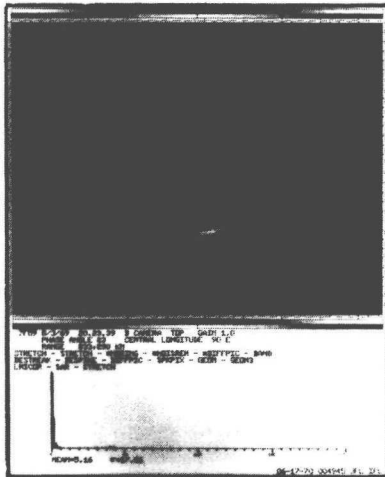
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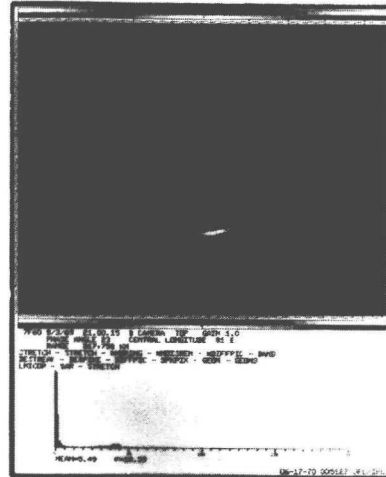
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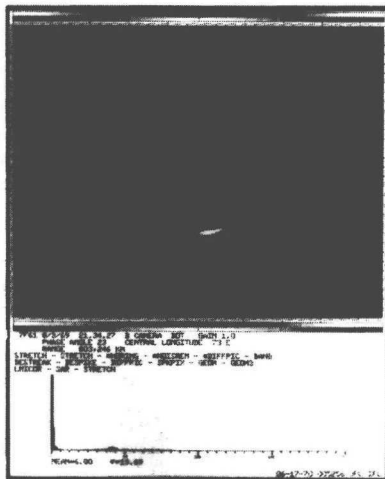
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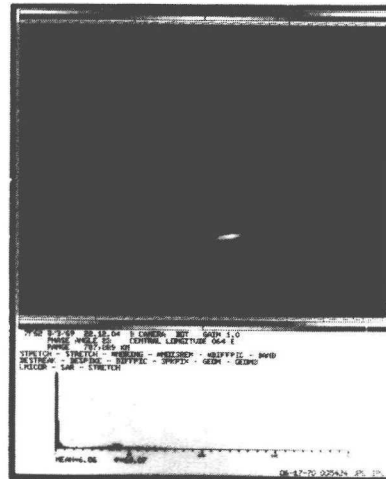
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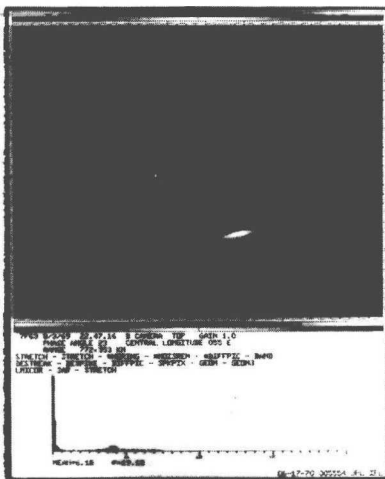
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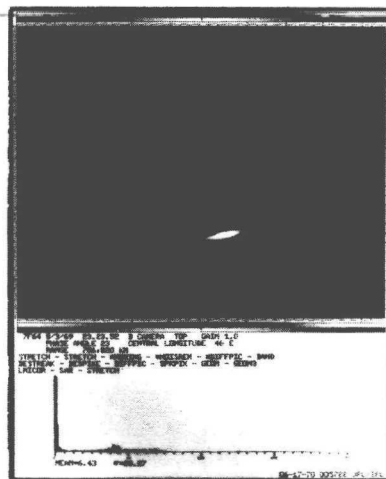
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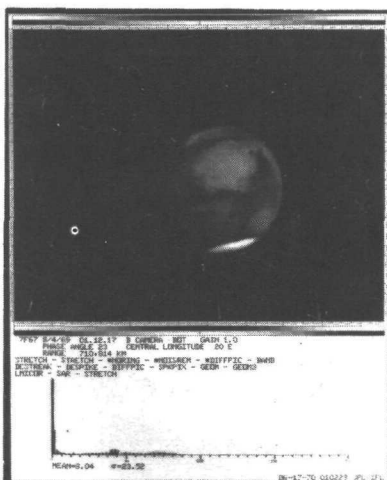
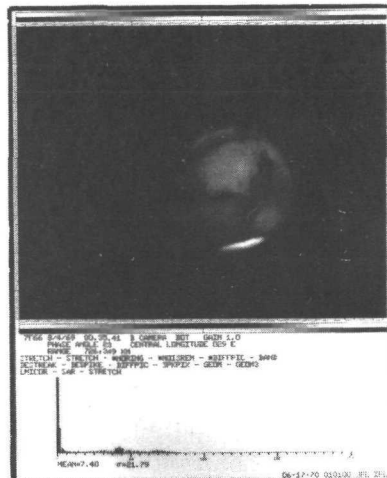
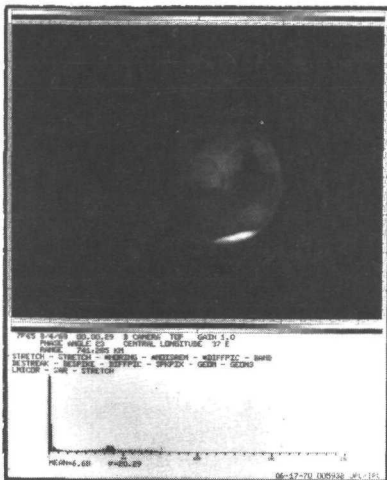
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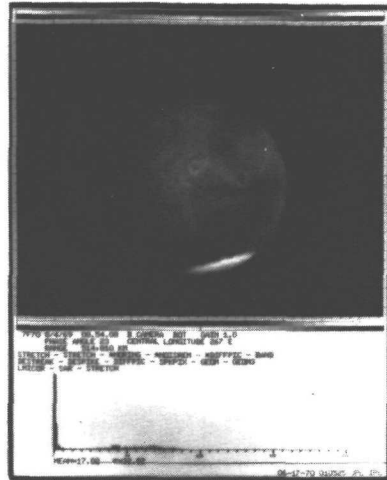
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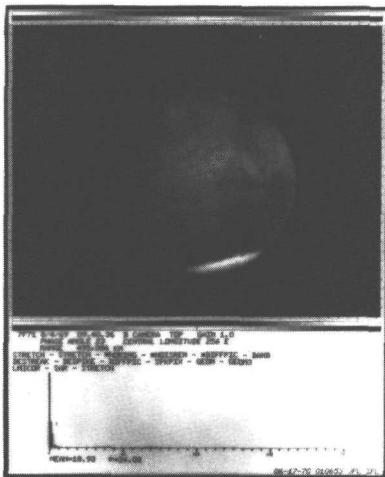
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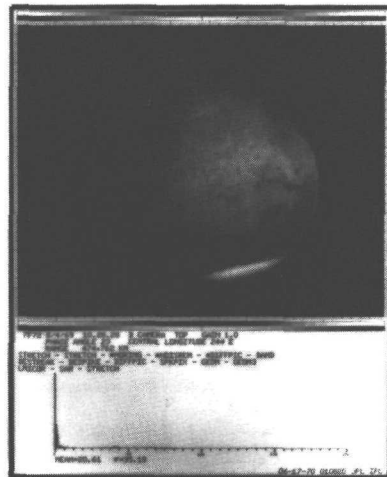
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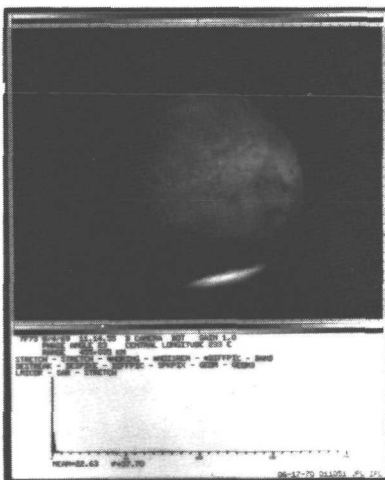
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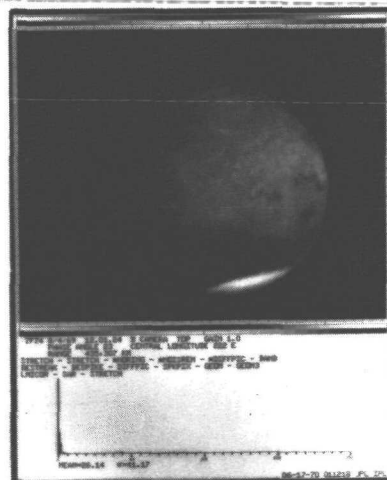
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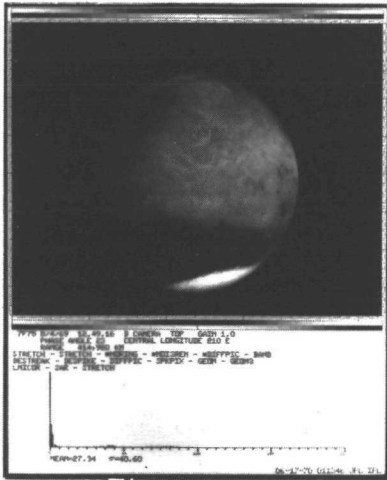
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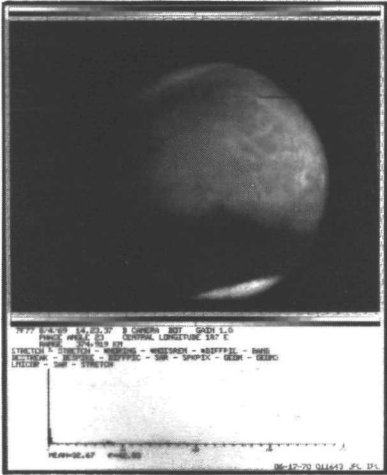
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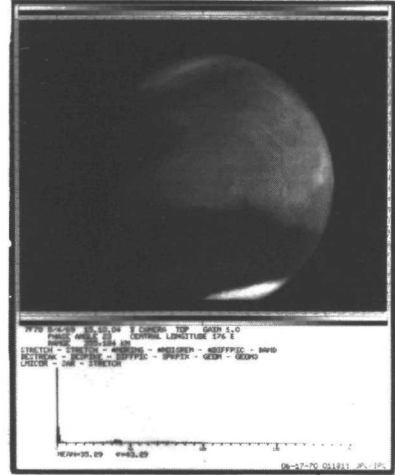
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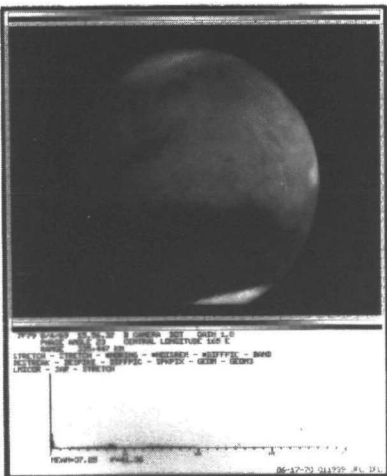
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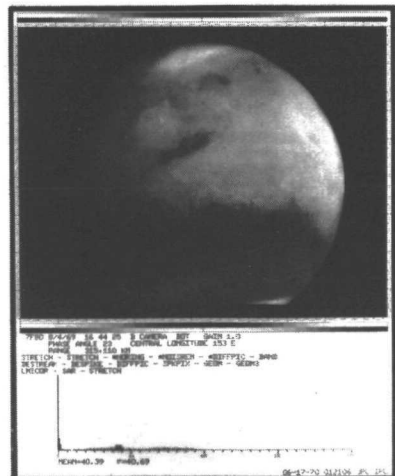
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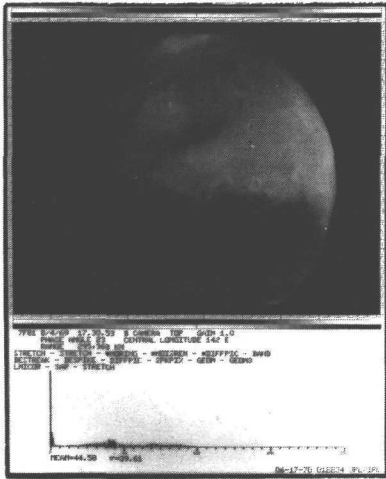
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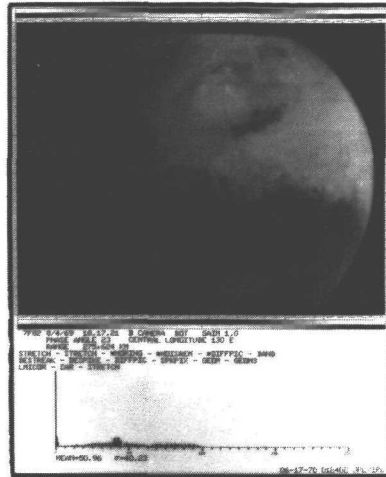
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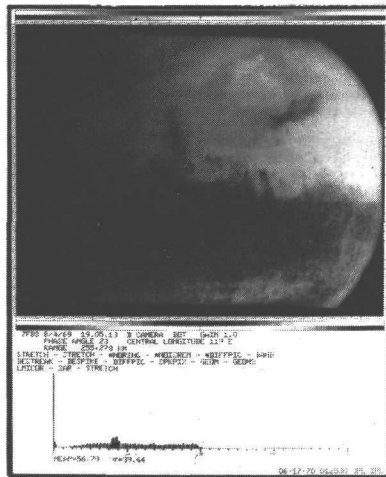
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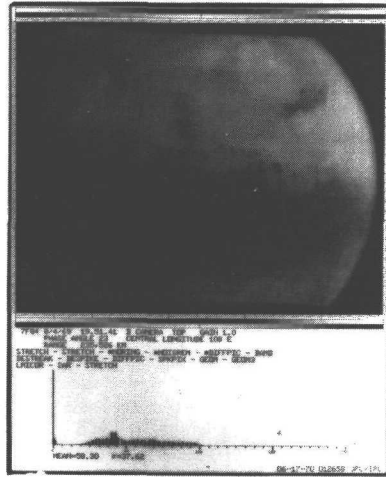
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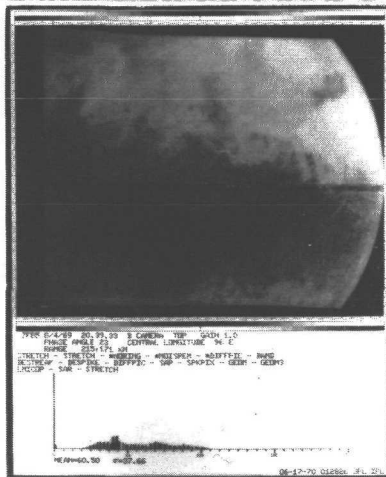
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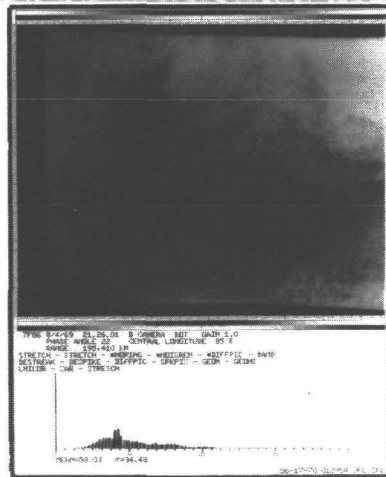
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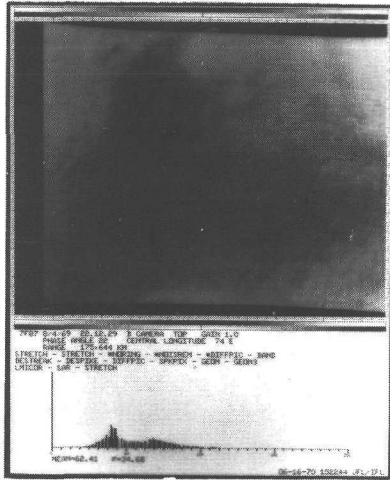
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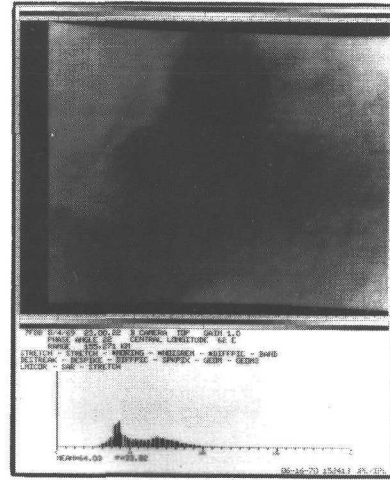
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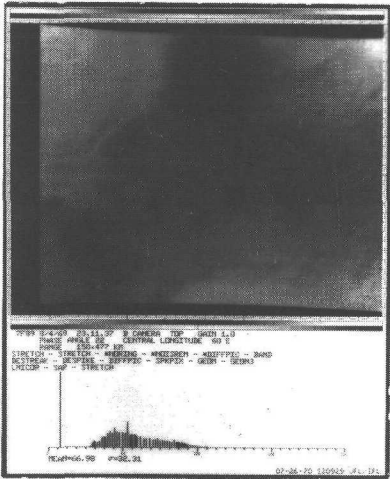
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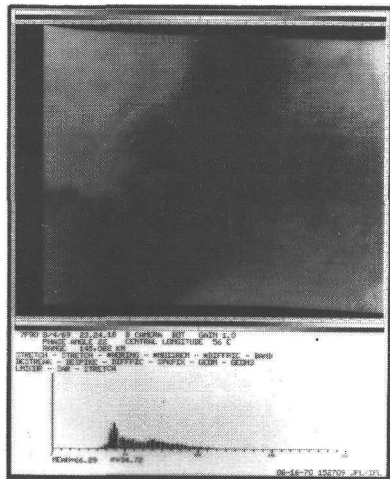
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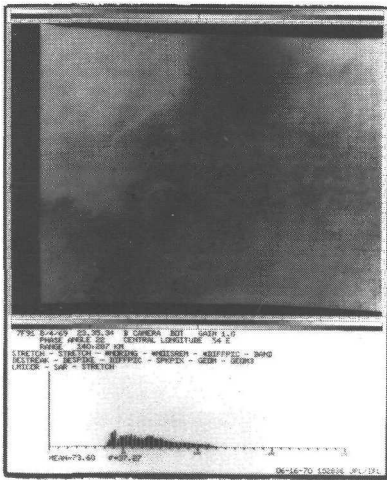
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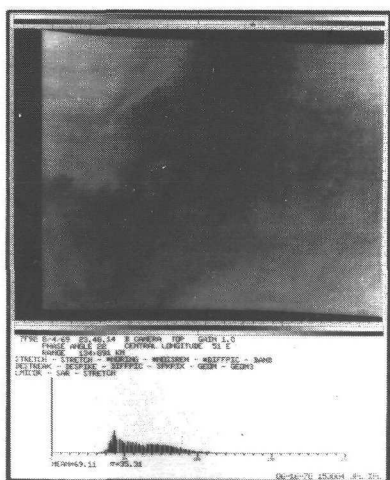
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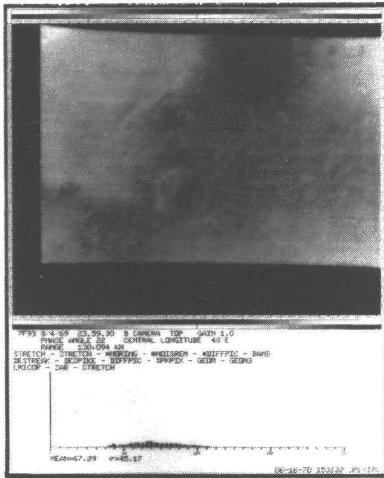
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7F91



7F92



7F93 8-4-58 23.58.50 3 CAMERA TOP DATA 1.0
PAGE 0001 OF 0001 CONTING LENGTH 40.1
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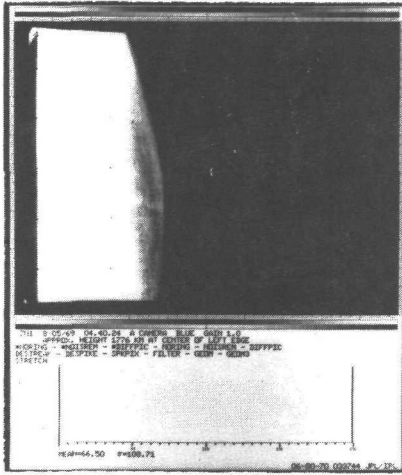
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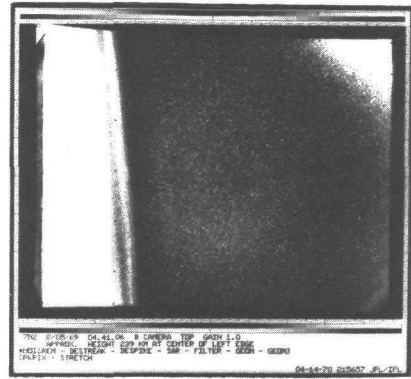
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MARINER 7
NEAR-ENCOUNTER

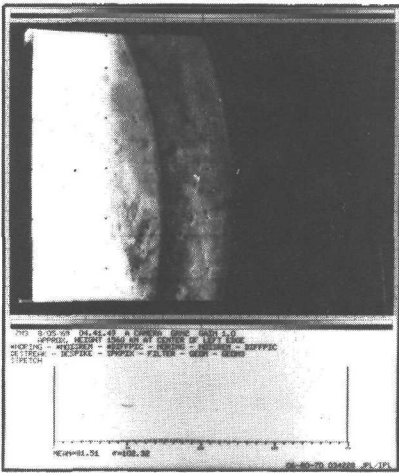
Frames 7N1 through 7N32



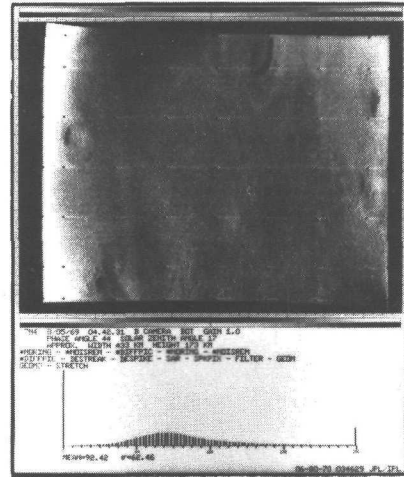
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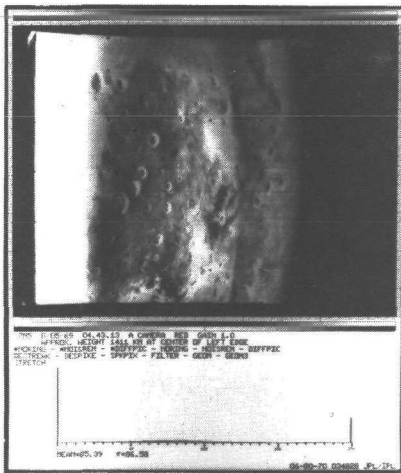
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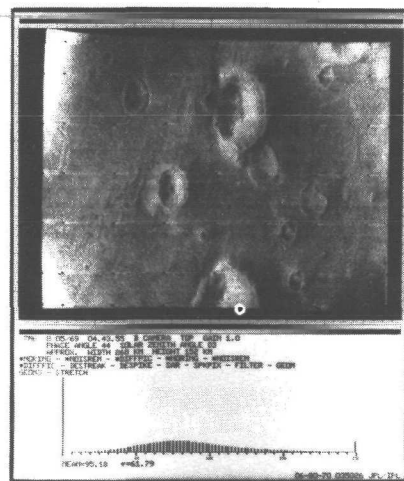
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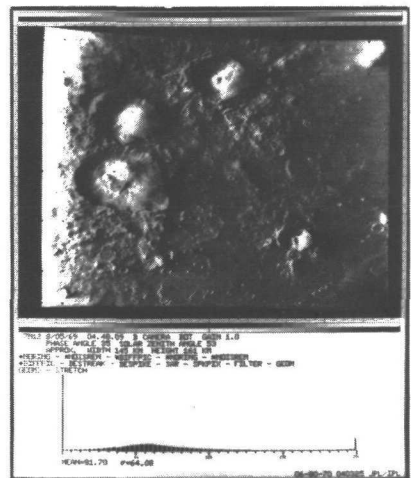
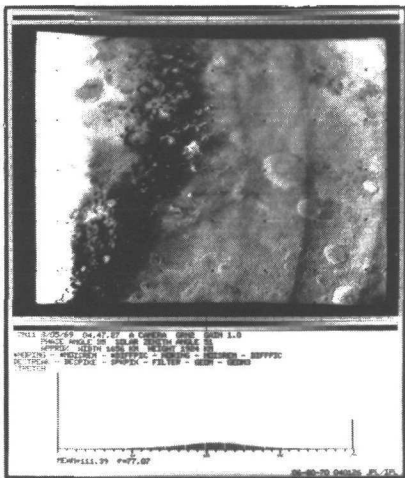
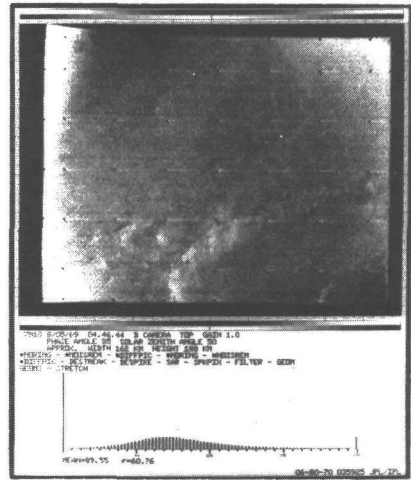
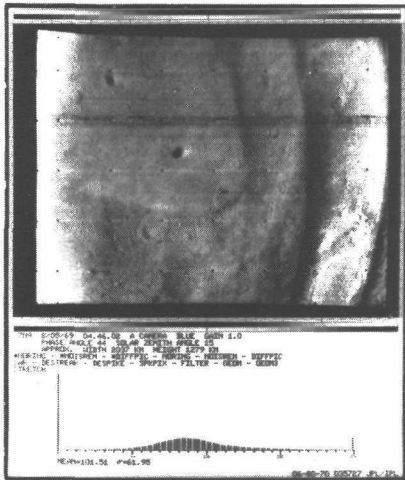
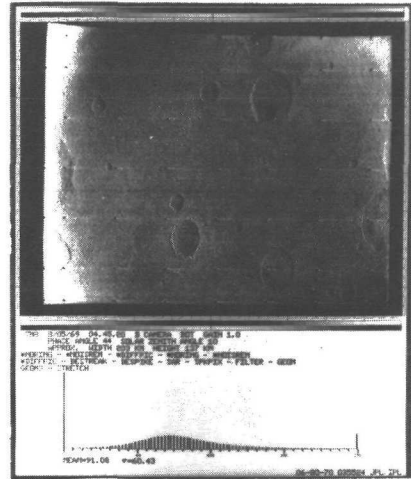
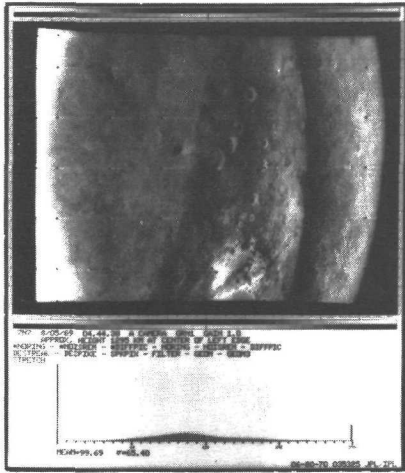
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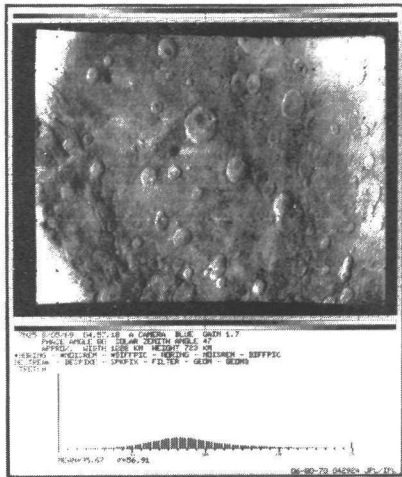


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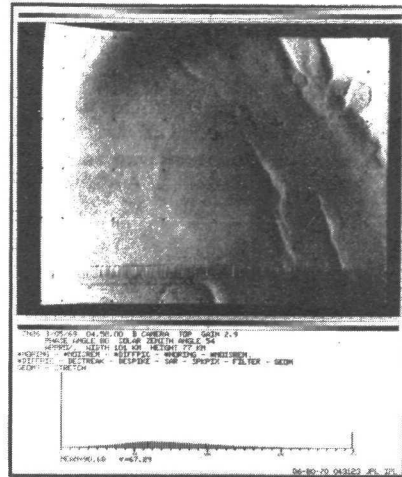


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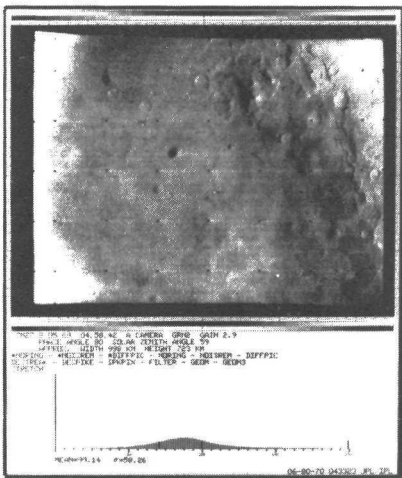




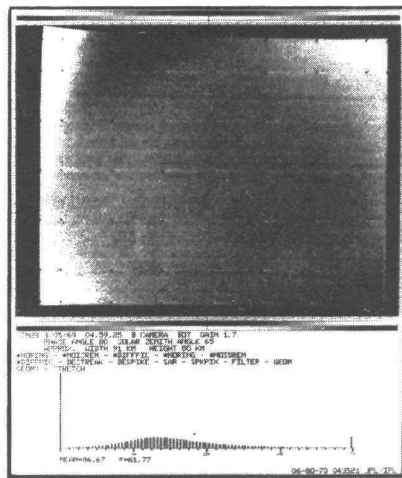
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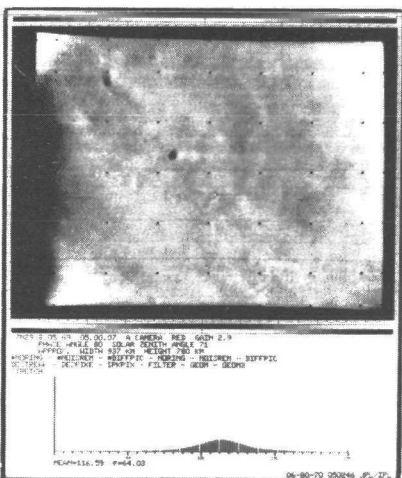
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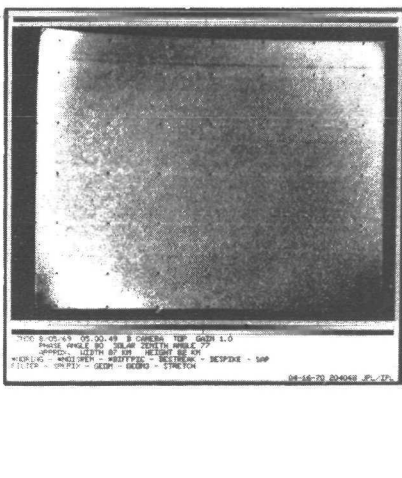
7N27



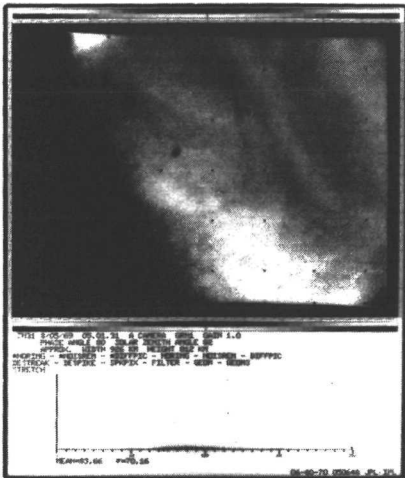
7N28



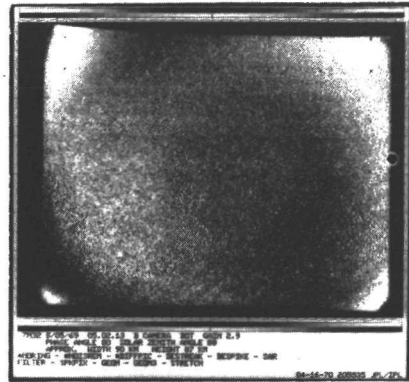
7N29



7N30

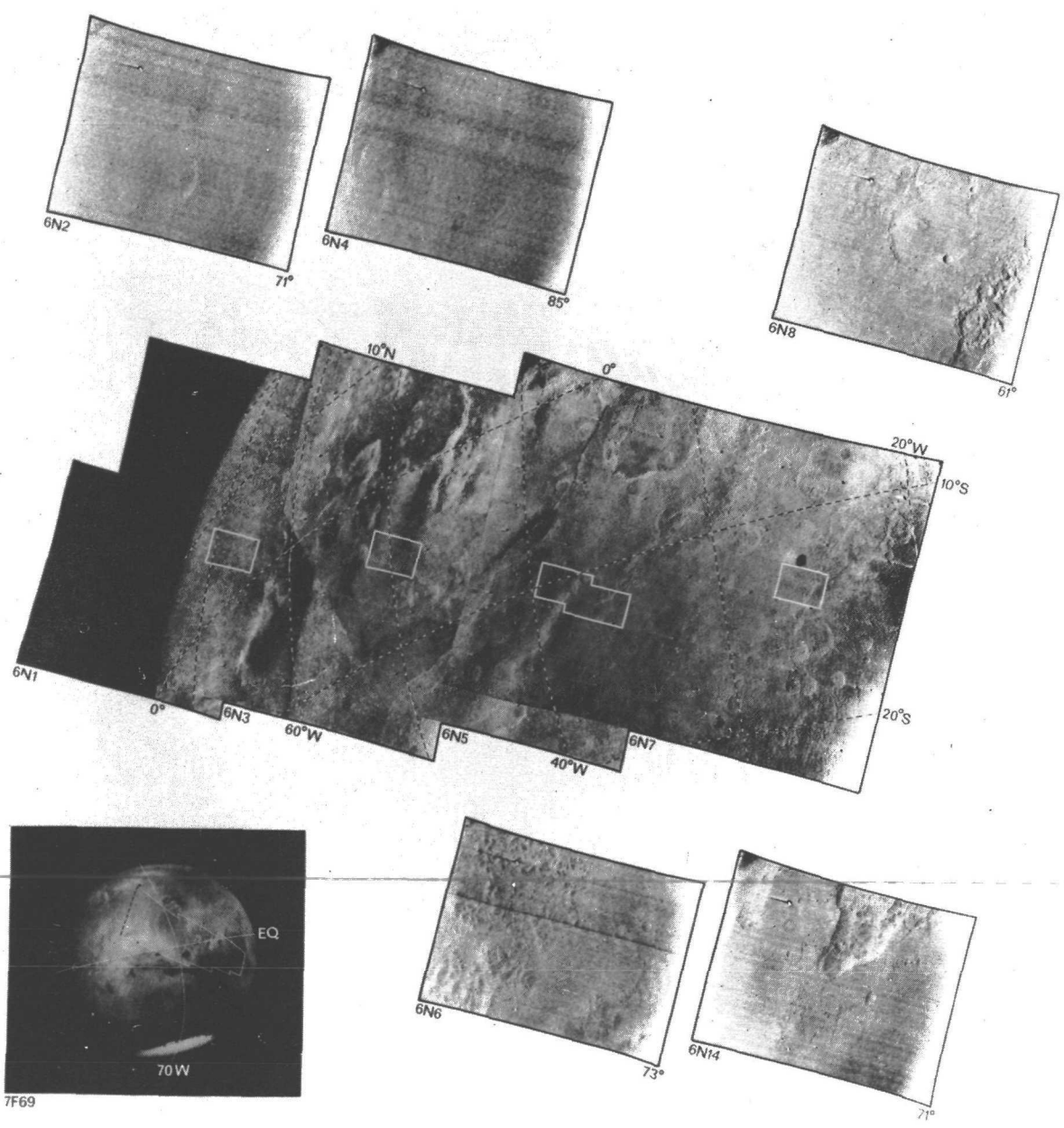


7N31

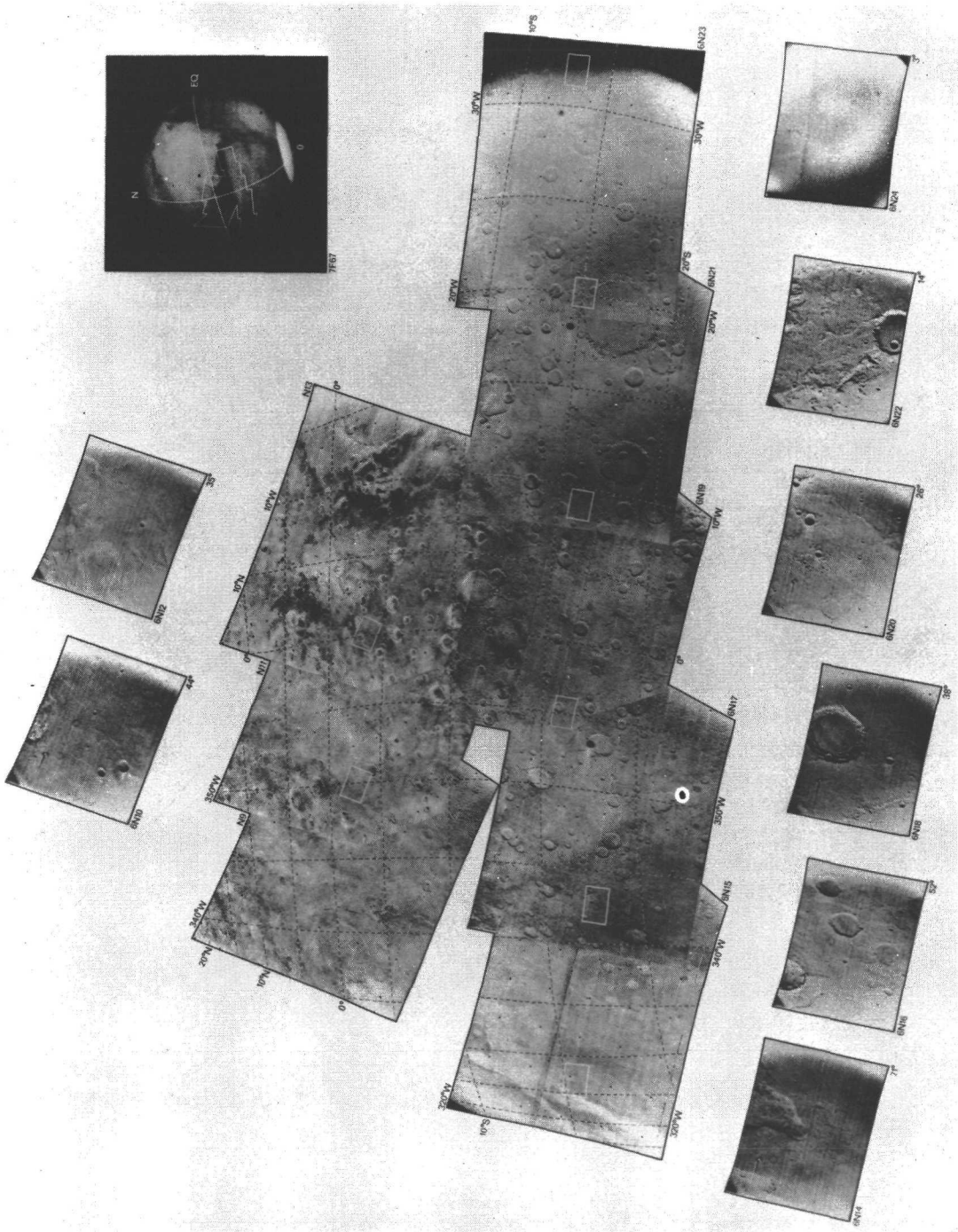


7N32

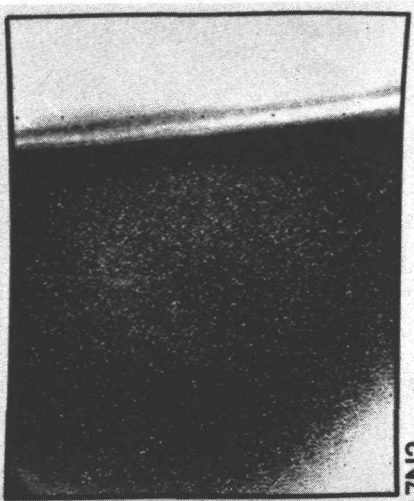
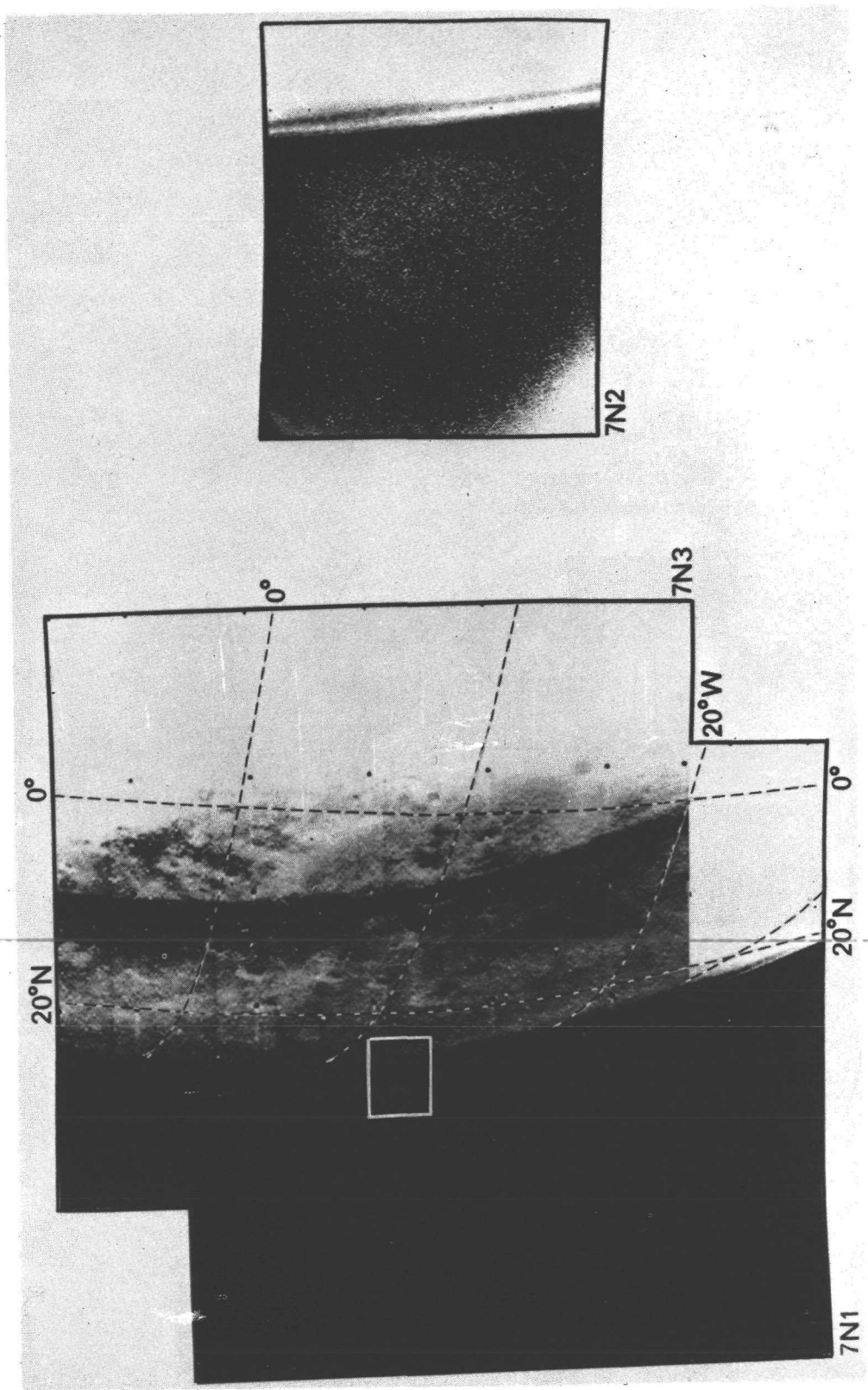
MARINER 6 AND 7
TV MOSAICS



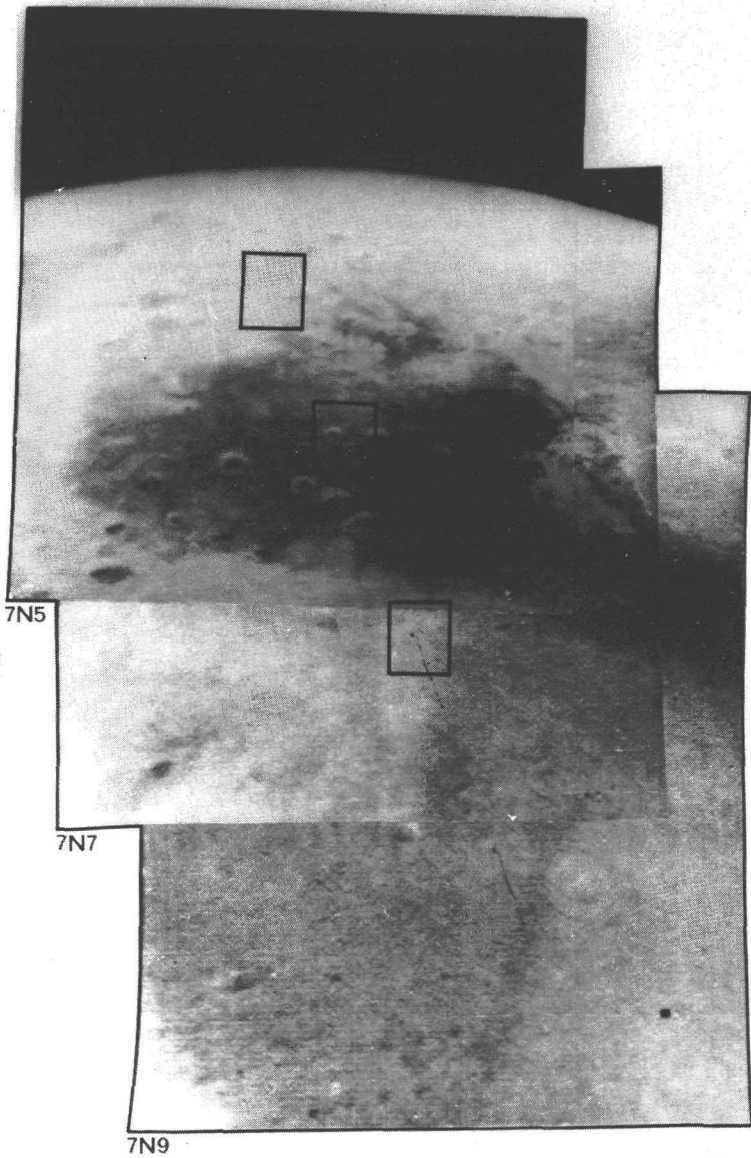
6N1-6N8
Aurorae Sinus



6N9-6N23
Meridiani Sinus



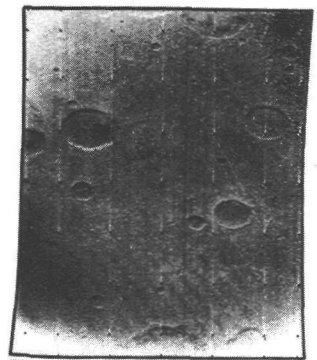
7N1 - 7N3
Limb



7N4

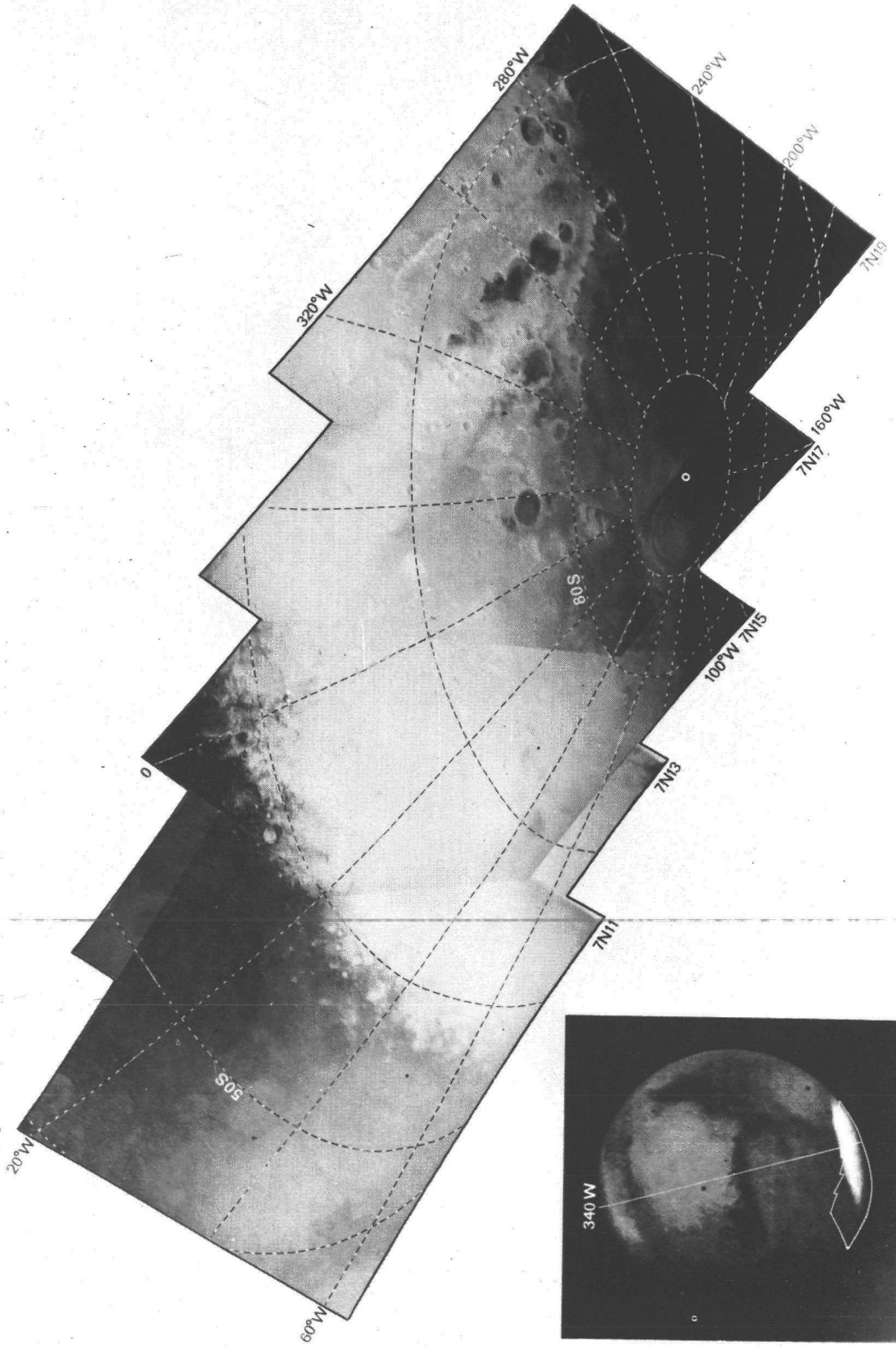


7N6

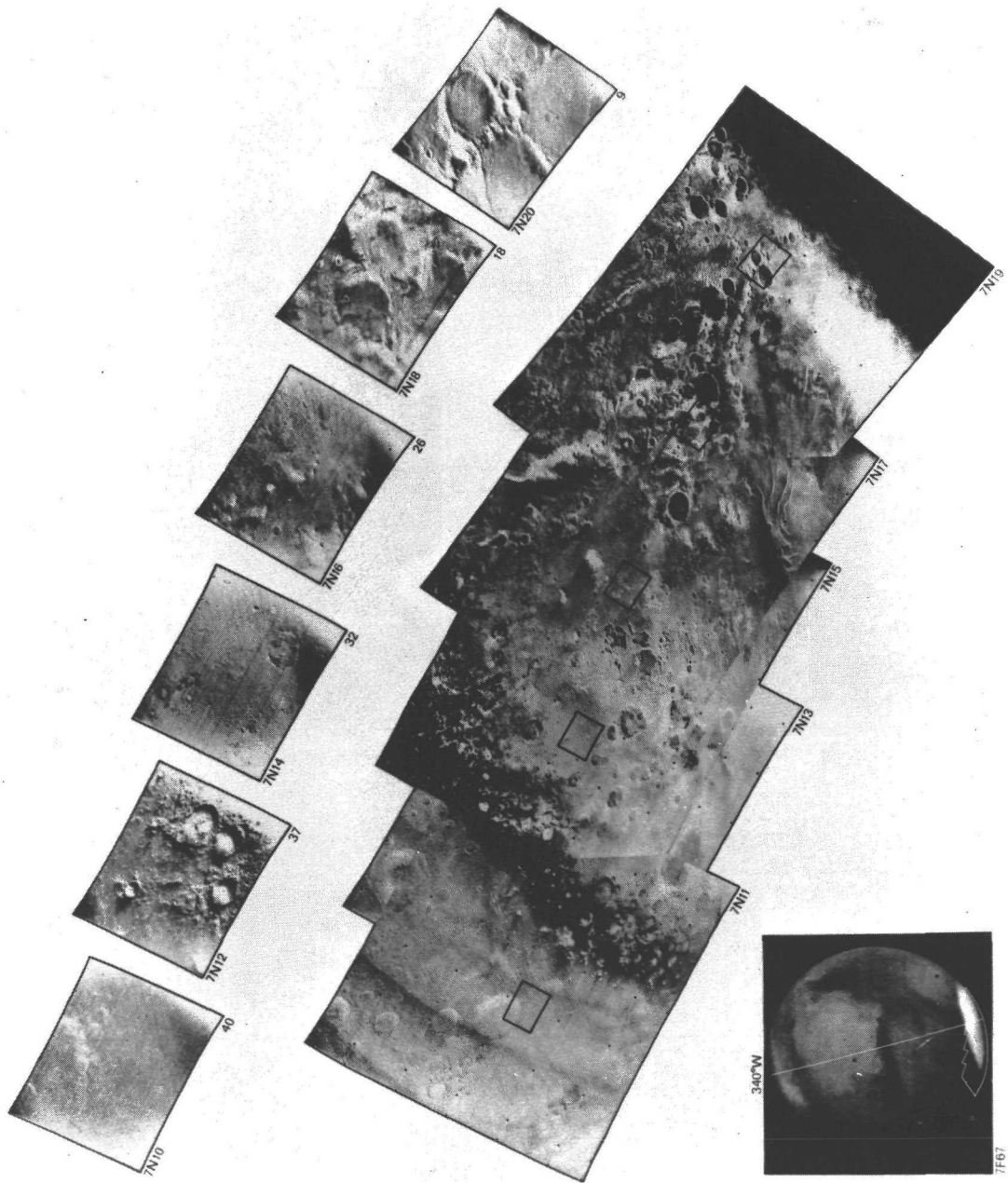


7N8

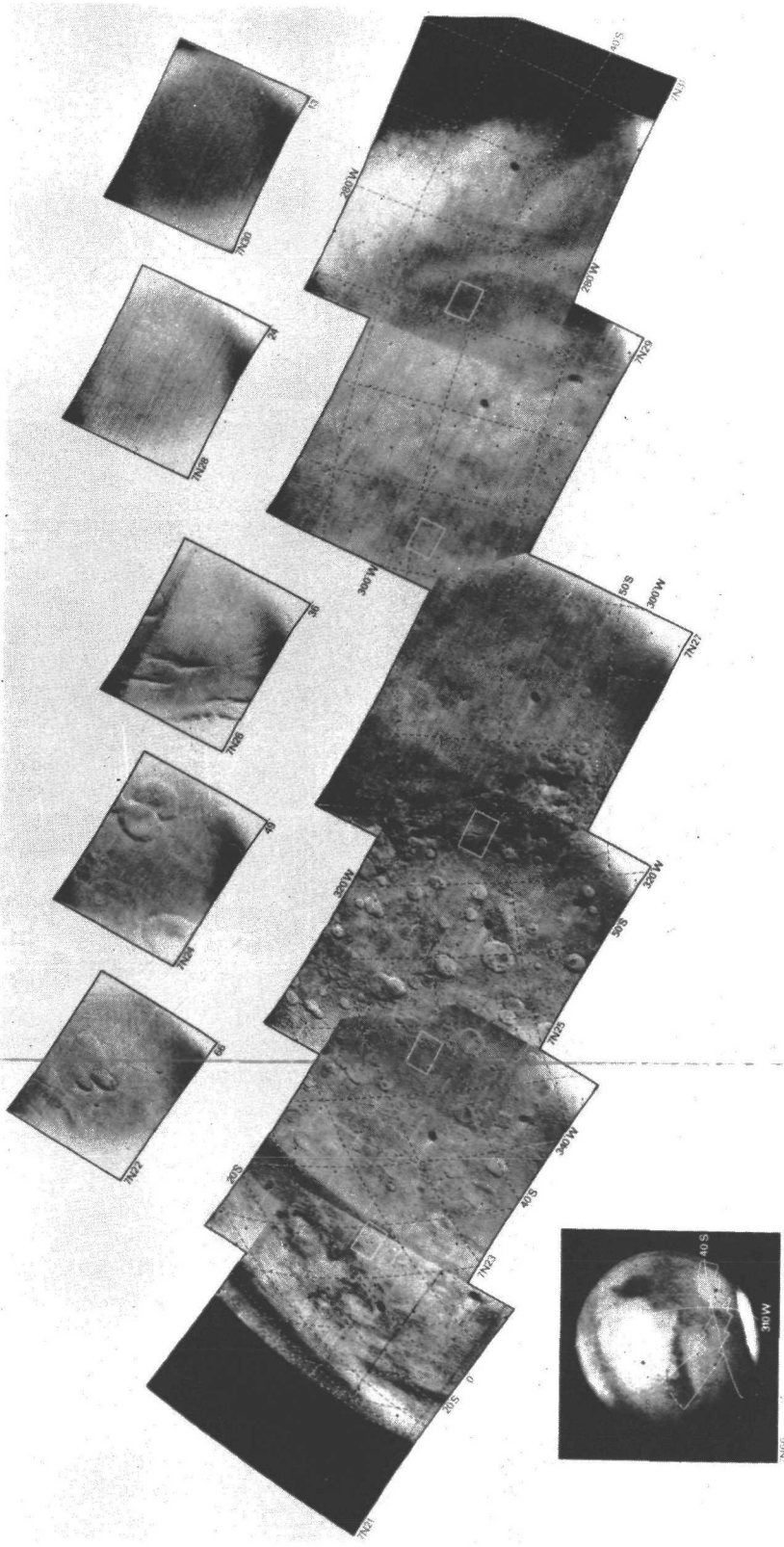
7N4-7N9
Meridiani Sinus



7N11 - 7N19
Polar Cap-Photometric Version



7N10-7N20
 Polar Cap - Maximum Discriminability Version



7N21-7N31
Noachis - Hellas

APPENDIX B

CONIC PROJECTIONS

This appendix contains a graphic representation of the location and position of the Mariner 6 and 7 TV frames. Each frame is labeled by mission and frame number in the upper left corner. The time of exposure is given as time before encounter (e.g., E - 13 min 59.2 sec). The cone angle, clock angle, and twist angle are illustrated in figure B-1. Slant angle is defined as the distance of the spacecraft from the center of the planet. The EM angle is the angle between anti-optic ray and the surface normal at the intercept point; the IN angle is the angle between the surface normal and the sun direction at the intercept point.

The data accuracy is assumed to be extremely good for all of the Mariner 6 FE pictures and all but the last few Mariner 7 FE pictures. For the closer Mariner 7 FE pictures (No. 86-93), the planet more than fills the field of view, and it becomes more difficult to calculate the exact camera pointing angles.

Regarding the NE pictures, the data quality is good for Mariner 6 and fair for Mariner 7. The latter is less accurate because of damage to important platform pointing angle telemetry channels of Mariner 7, which degraded the orbit determination process.

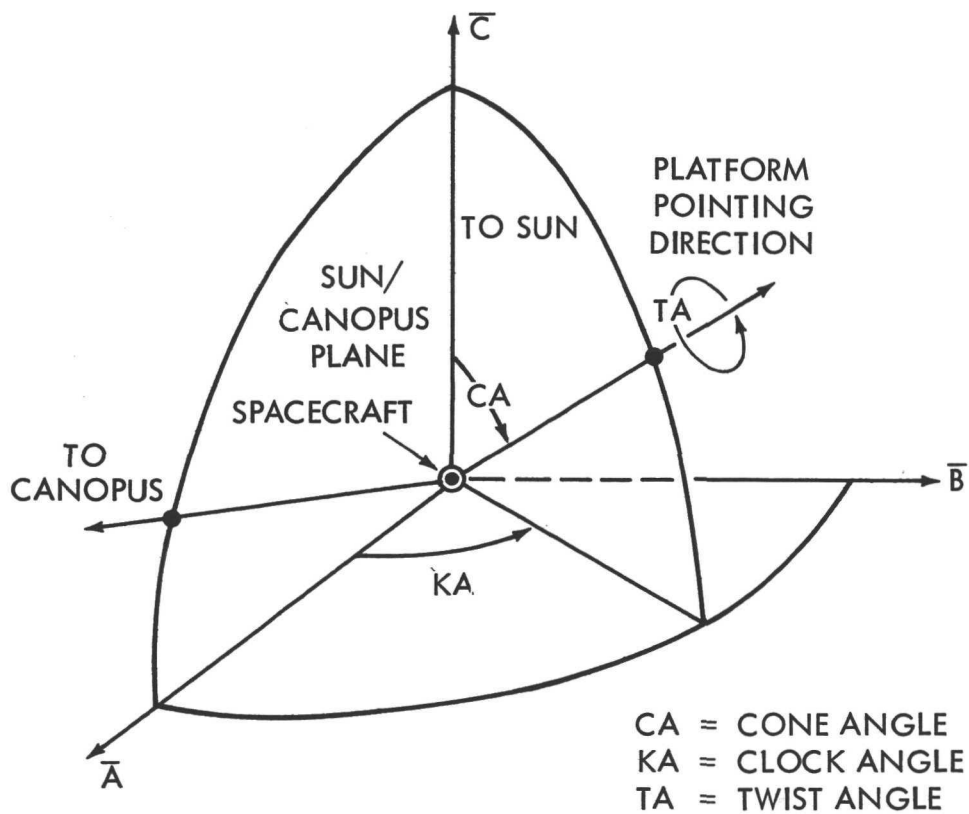


Figure B-1 Cone Angle, Clock, Twist Angle Defined

MARINER 6 FAR-ENCOUNTER CONIC PROJECTIONS

KEY: E sub-earth point
 S sub-spacecraft point
 Z sub-solar point
 P Phobos
 D Deimos
 * terminator

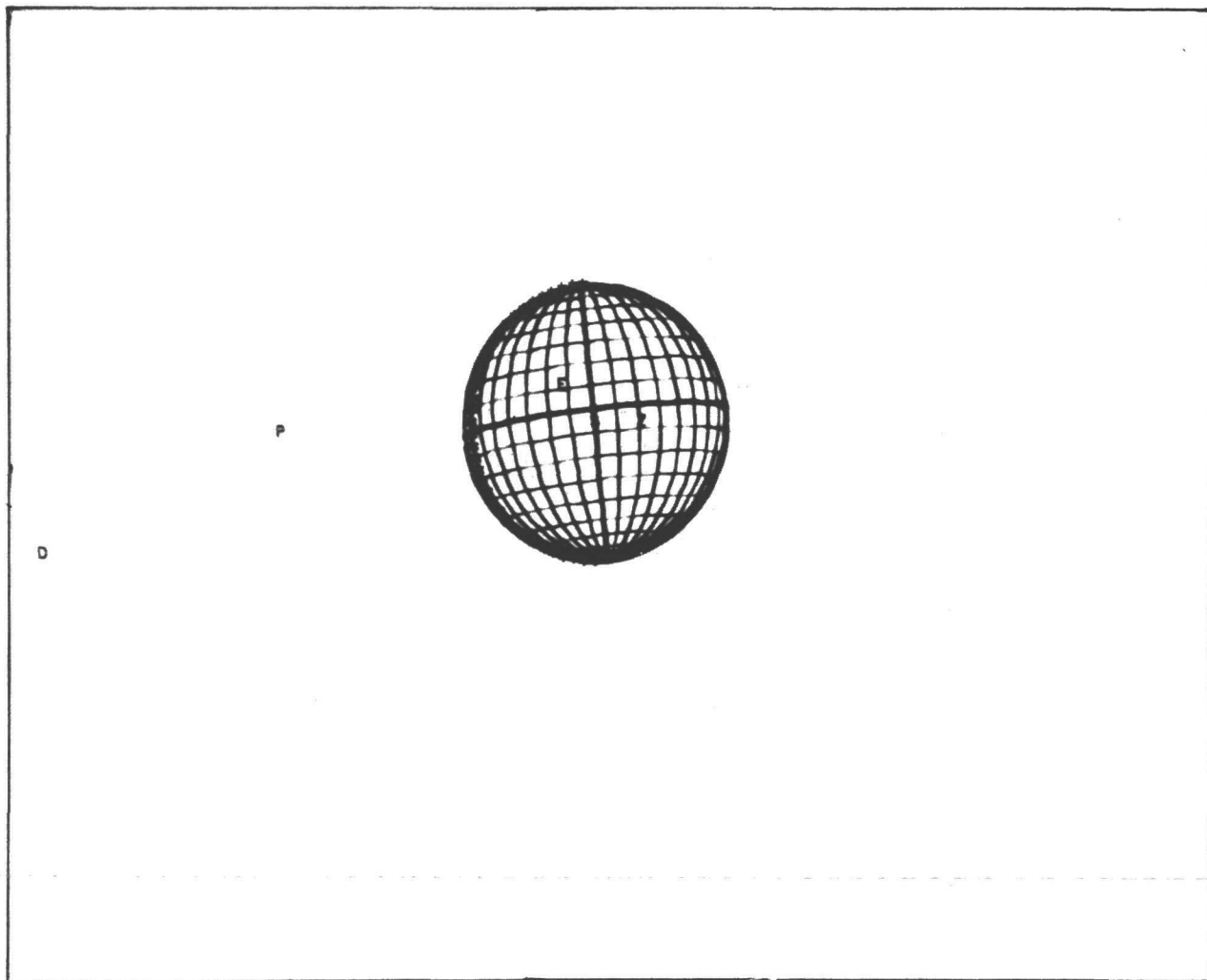
6 FE 1

SHUTTERED 29 JULY 5 hr 28 min 48.131 sec (GMT)

ENCOUNTER MINUS 47 hr 50 min 18.852 sec

S/C ALTITUDE 1,240,828 km, LONG. OF SUB-S/C POINT 260.35 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 34.0 km



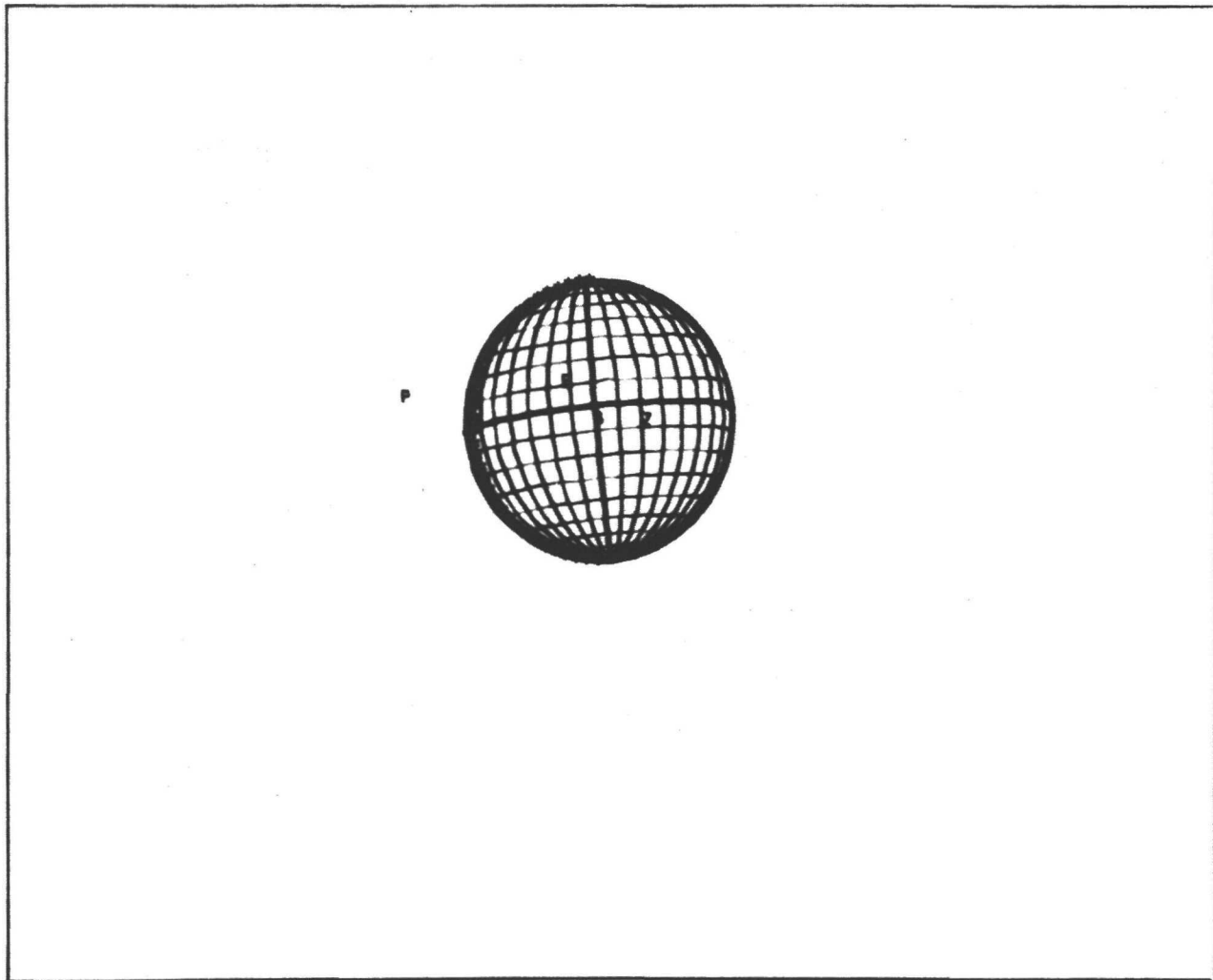
6 FE 2

SHUTTERED 29 JULY 6 hr 5 min 24.763 sec (GMT)

ENCOUNTER MINUS 47 hr 13 min 42.220 sec

S/C ALTITUDE 1,224,995 km, LONG. OF SUB-S/C POINT 251.44 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 33.4 km



6 FE 3

SHUTTERED 29 JULY 6 hr 42 min 1.397 sec (GMT)

ENCOUNTER MINUS 46 hr 37 min 5.586 sec

S/C ALTITUDE 1,209,162 km, LONG. OF SUB-S/C POINT 242.53 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 32.9 km



6 FE 4

SHUTTERED 29 JULY 7 hr 18 min 38.028 sec (GMT)

ENCOUNTER MINUS 46 hr 0 min 28.955 sec

S/C ALTITUDE 1,193,331 km, LONG. OF SUB-S/C POINT 233.62 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 32.5 km



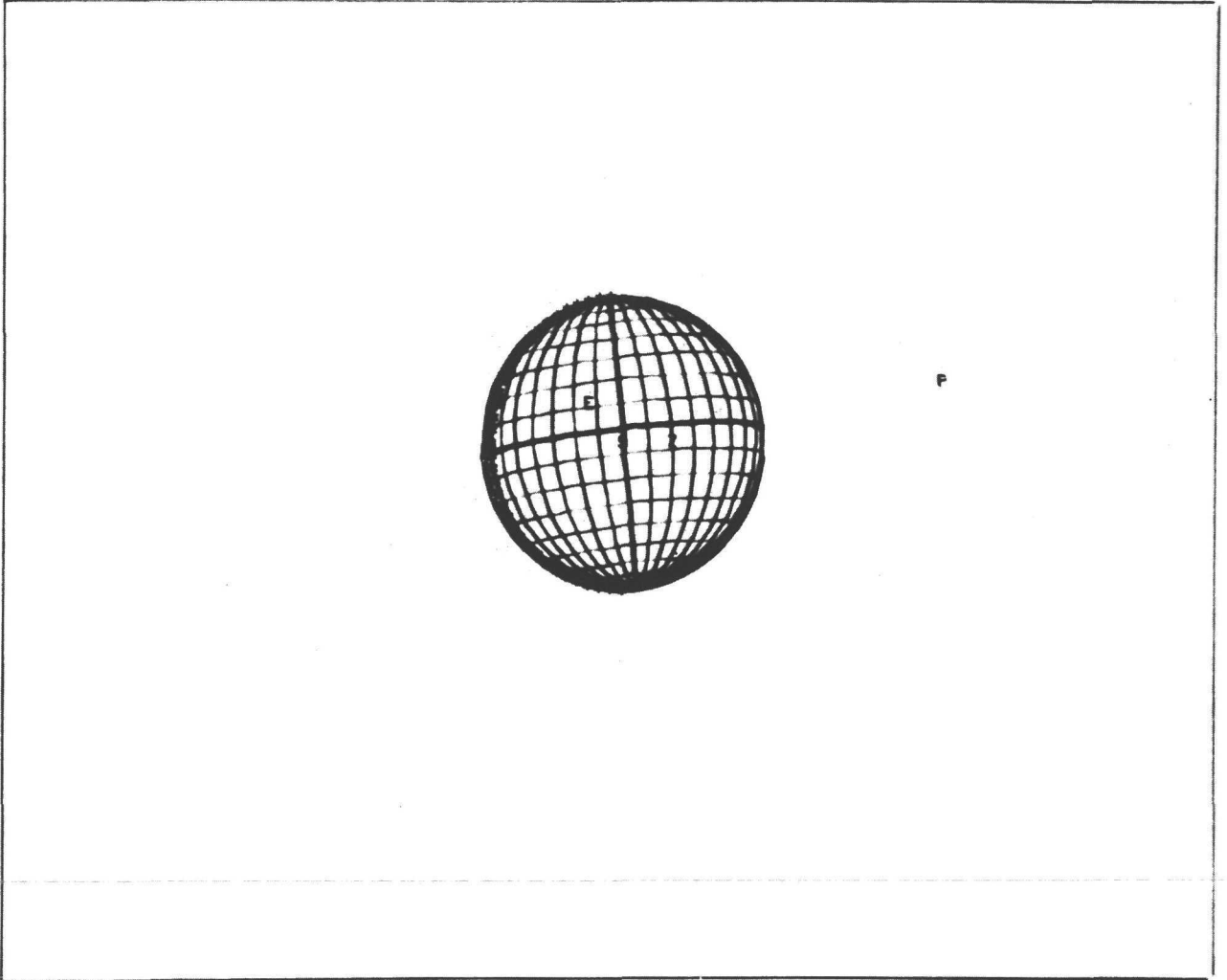
6 FE 5

SHUTTERED 29 JULY 7 hr 56 min 39.147 sec (GMT)

ENCOUNTER MINUS 45 hr 22 min 27.836 sec

S/C ALTITUDE 1,176,887 km, LONG. OF SUB-S/C POINT 224.36 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 32.1 km



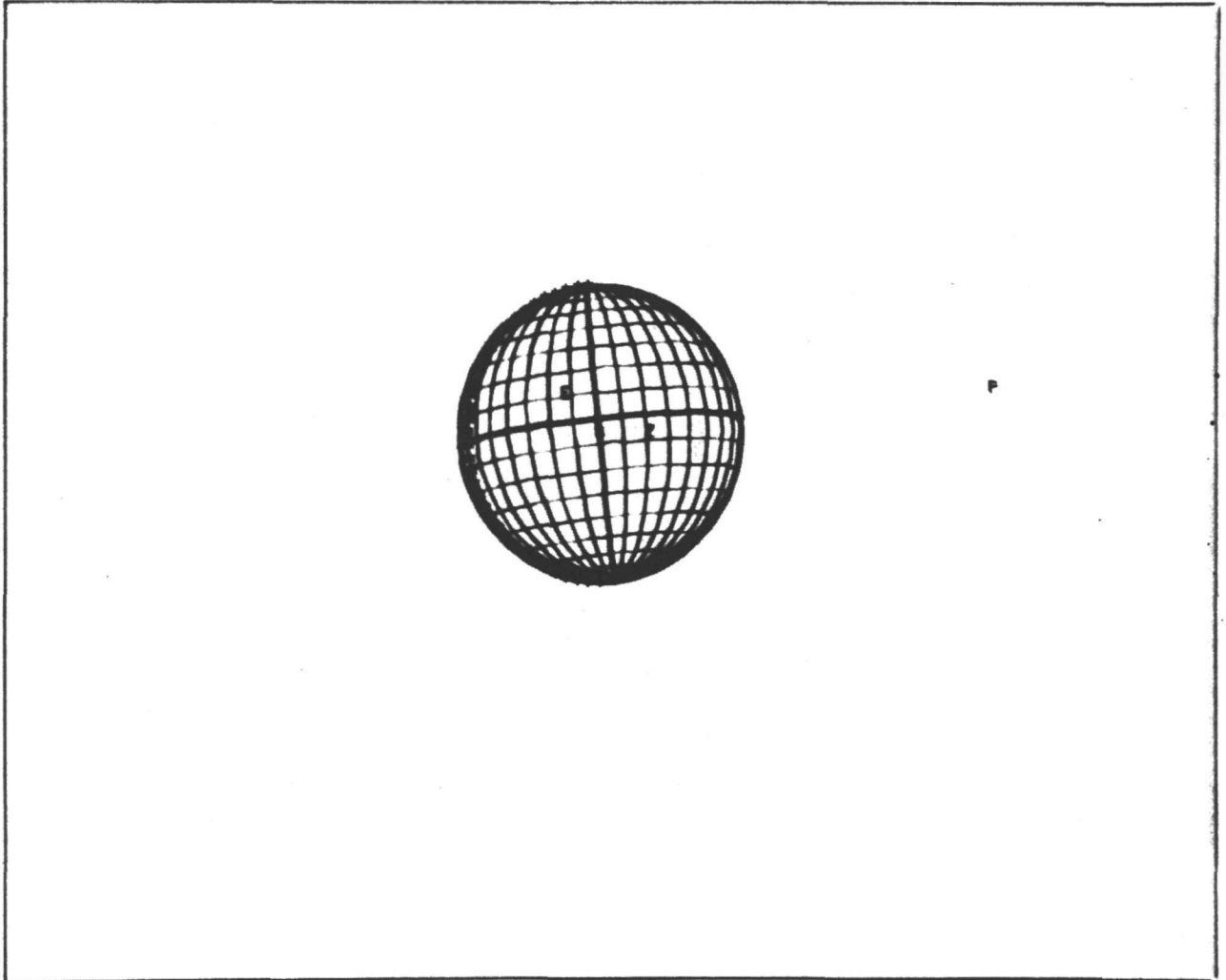
6 FE 6

SHUTTERED 29 JULY 8 hr 33 min 15.780 sec (GMT)

ENCOUNTER MINUS 46 hr 45 min 51.203 sec

S/C ALTITUDE 1,161,055 km, LONG. OF SUB-S/C POINT 215.45 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 31.7 km



6 FE 7

SHUTTERED 29 JULY 9 hr 9 min 52.413 sec (GMT)

ENCOUNTER MINUS 44 hr 9 min 14.570 sec

S/C ALTITUDE 1,145,222 km, LONG. OF SUB-S/C POINT 206.54 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 31.3 km



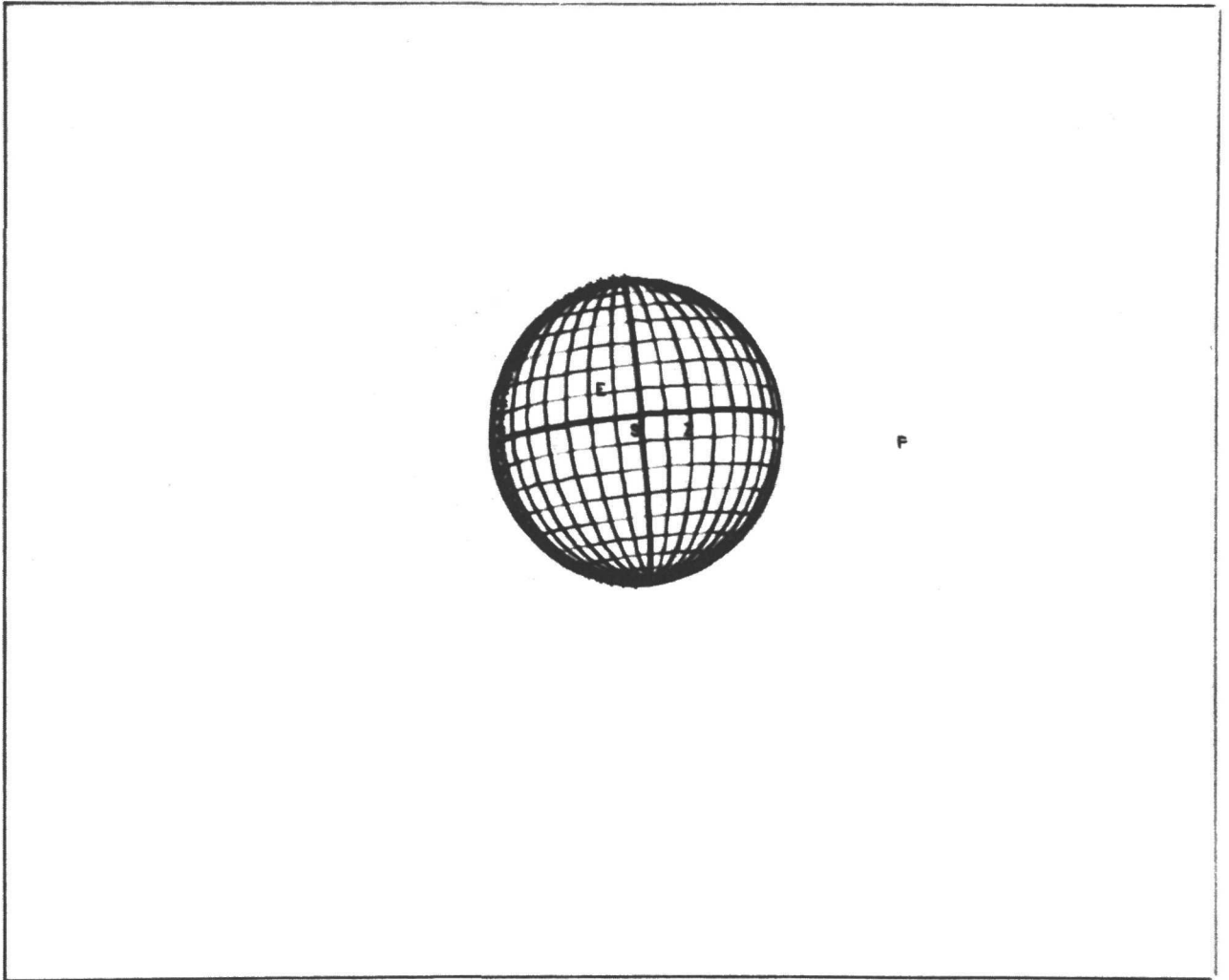
6 FE 8

SHUTTERED 29 JULY 9 hr 46 min 29.045 sec (GMT)

ENCOUNTER MINUS 43 hr 32 min 37.938 sec

S/C ALTITUDE 1,129,389 km, LONG. OF SUB-S/C POINT 197.63 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 30.8 km



6 FE 9

SHUTTERED 29 JULY 10 hr 24 min 30.163 sec (GMT)

ENCOUNTER MINUS 42 hr 54 min 36.820 sec

S/C ALTITUDE 1,112,948 km, LONG. OF SUB-S/C POINT 188.38 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 30.4 km



6 FE 10

SHUTTERED 29 JULY 11 hr 1 min 6.794 sec (GMT)

ENCOUNTER MINUS 42 hr 18 min 0.189 sec

S/C ALTITUDE 1,097,114 km, LONG. OF SUB-S/C POINT 179.46 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 30.0 km



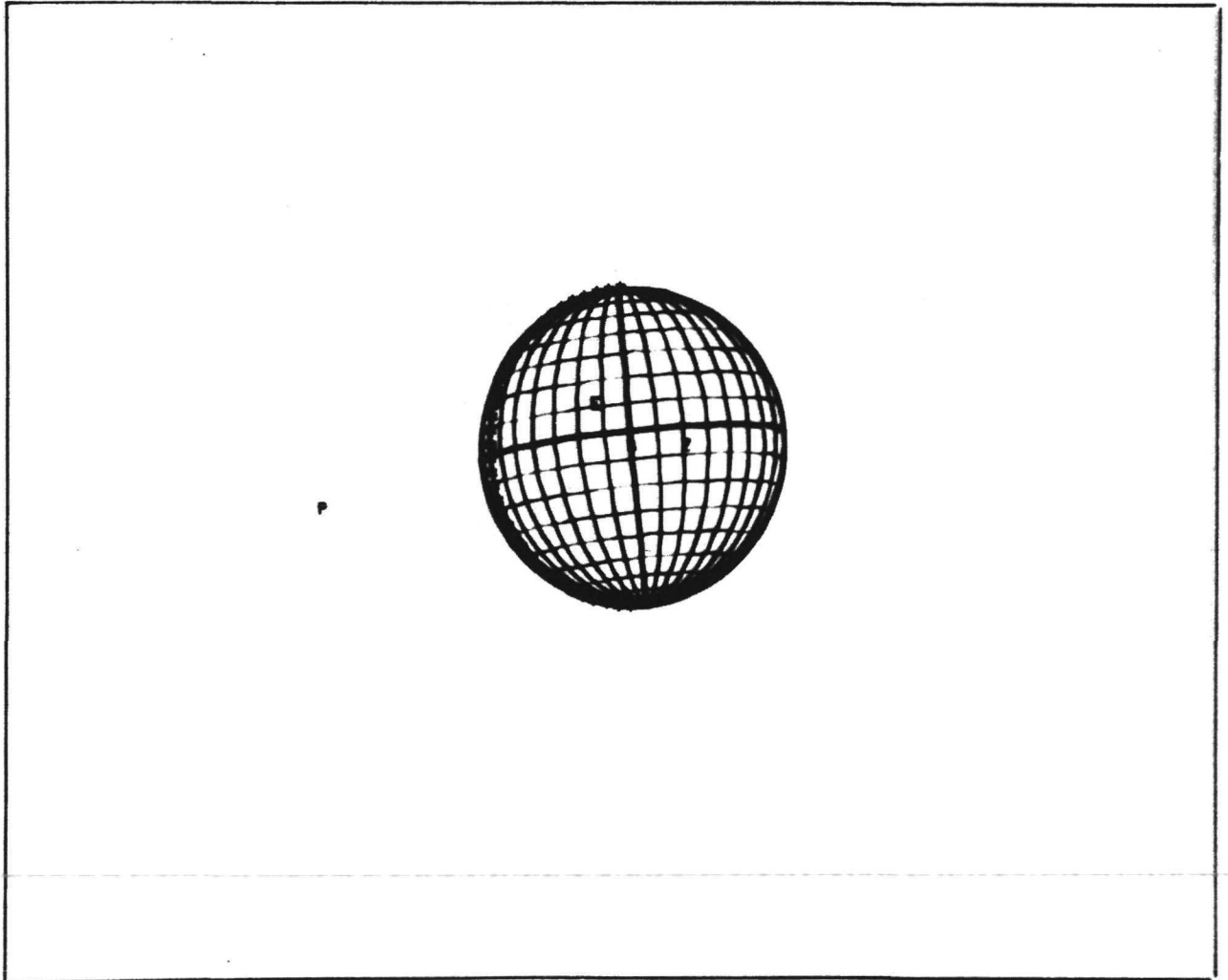
6 FE 11

SHUTTERED 29 JULY 11 hr 39 min 46.146 sec (GMT)

ENCOUNTER MINUS 41 hr 39 min 20.837 sec

S/C ALTITUDE 1,080,397 km, LONG. OF SUB-S/C POINT 170.06 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 29.5 km



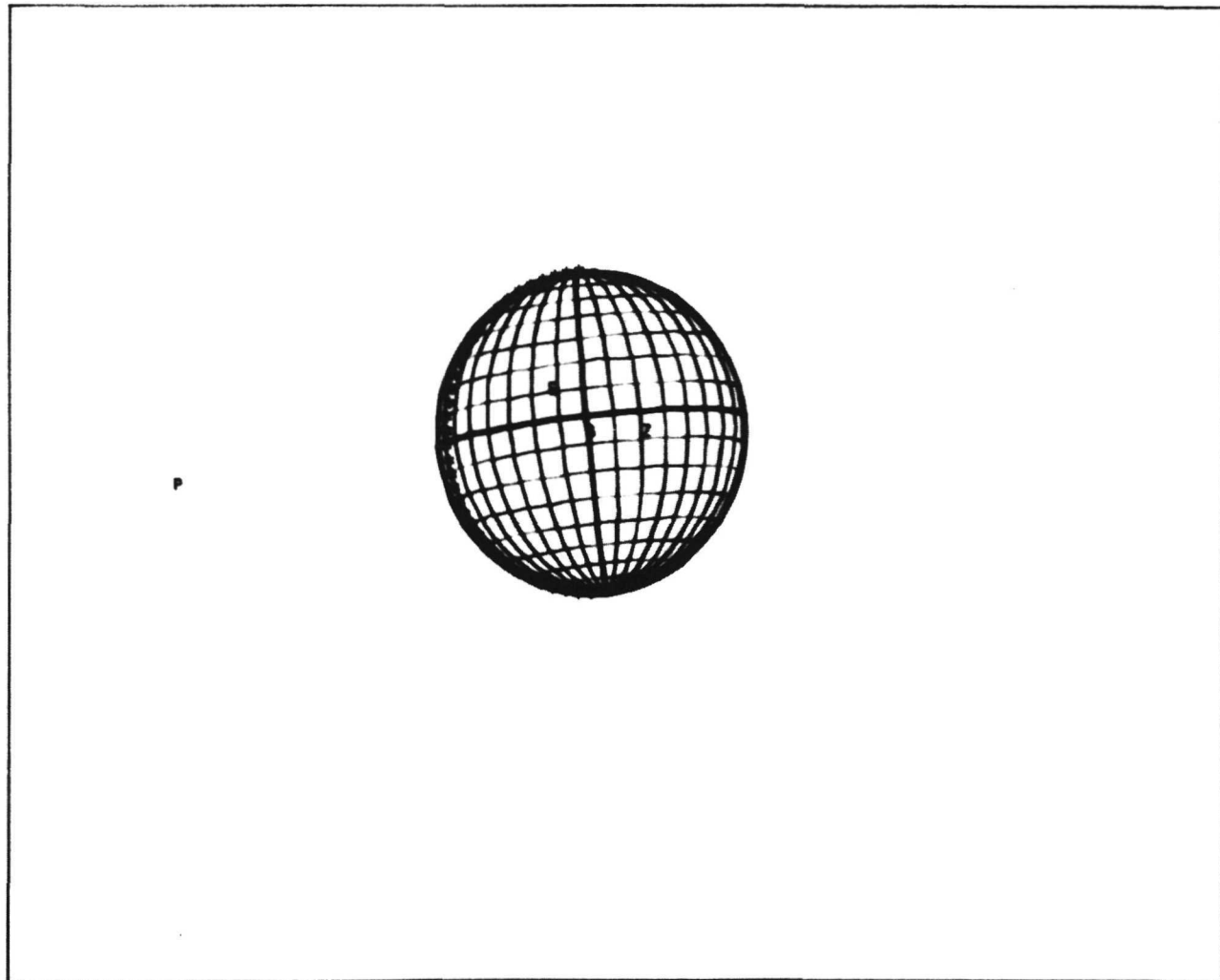
6 FE 12

SHUTTERED 29 JULY 12 hr 15 min 44.544 sec (GMT)

ENCOUNTER MINUS 41 hr 3 min 22.439 sec

S/C ALTITUDE 1,064,839 km, LONG. OF SUB-S/C POINT 161.30 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 29.0 km



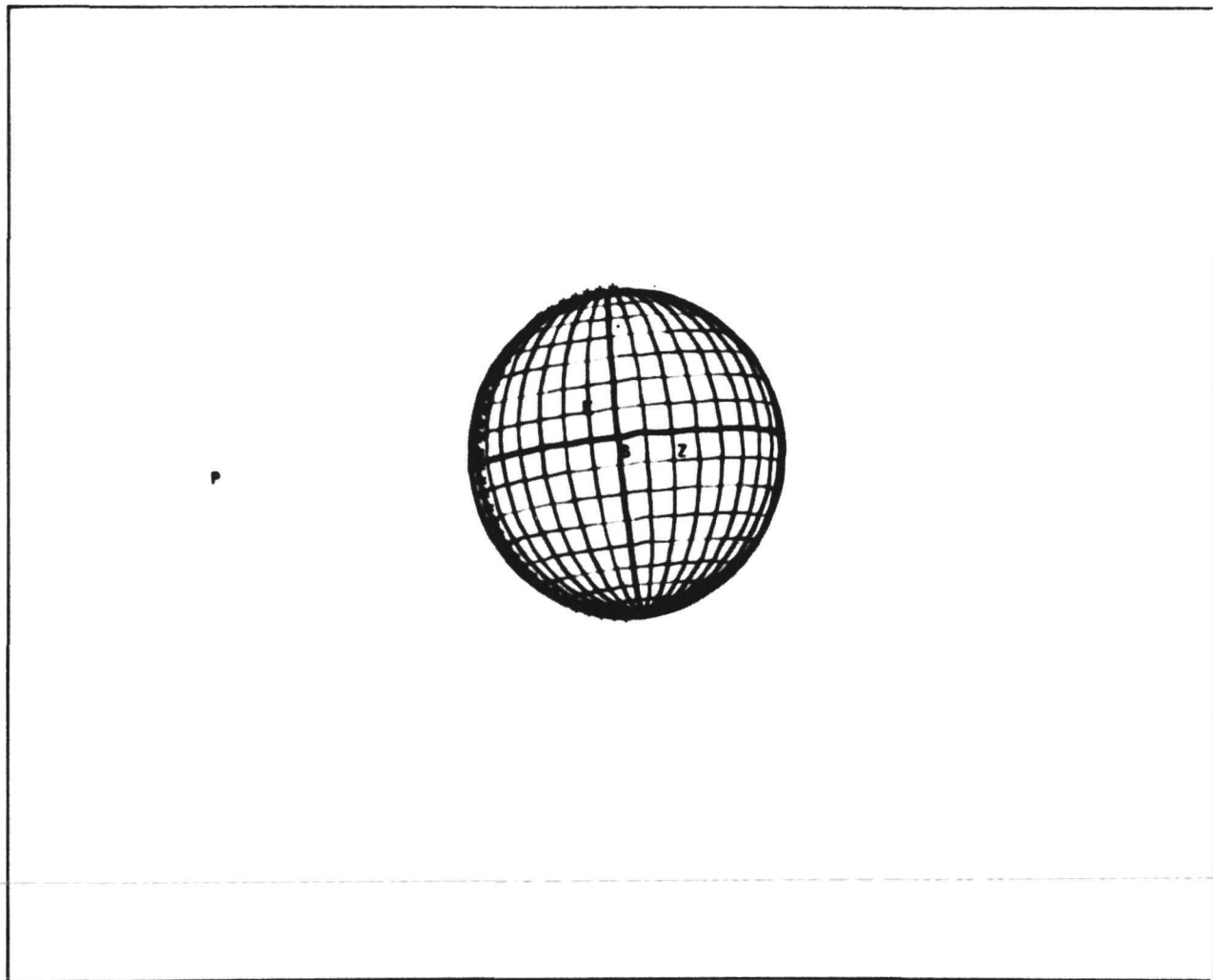
6 FE 13

SHUTTERED 29 JULY 12 hr 52 min 21.176 sec (GMT)

ENCOUNTER MINUS 40 hr 26 min 45.807 sec

S/C ALTITUDE 1,049,006 km, LONG. OF SUB-S/C POINT 152.28 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 28.6 km



6 FE 14

SHUTTERED 29 JULY 13 hr 28 min 57.809 sec (GMT)

ENCOUNTER MINUS 39 hr 50 min 9.174 sec

S/C ALTITUDE 1,033,175km, LONG. OF SUB-S/C POINT 143.37 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 28.2 km



6 FE 15

SHUTTERED 29 JULY 14 hr 5 min 34.443 sec (GMT)

ENCOUNTER MINUS 39 hr 13 min 32.540 sec

S/C ALTITUDE 1,017,339 km, LONG. OF SUB-S/C POINT 134.45 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 27.8 km



6 FE 16

SHUTTERED 29 JULY 14 hr 43 min 35.559 sec (GMT)

ENCOUNTER MINUS 38 hr 35 min 31.424 sec

S/C ALTITUDE 1,000,898 km, LONG. OF SUB-S/C POINT 125.20 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 27.3 km



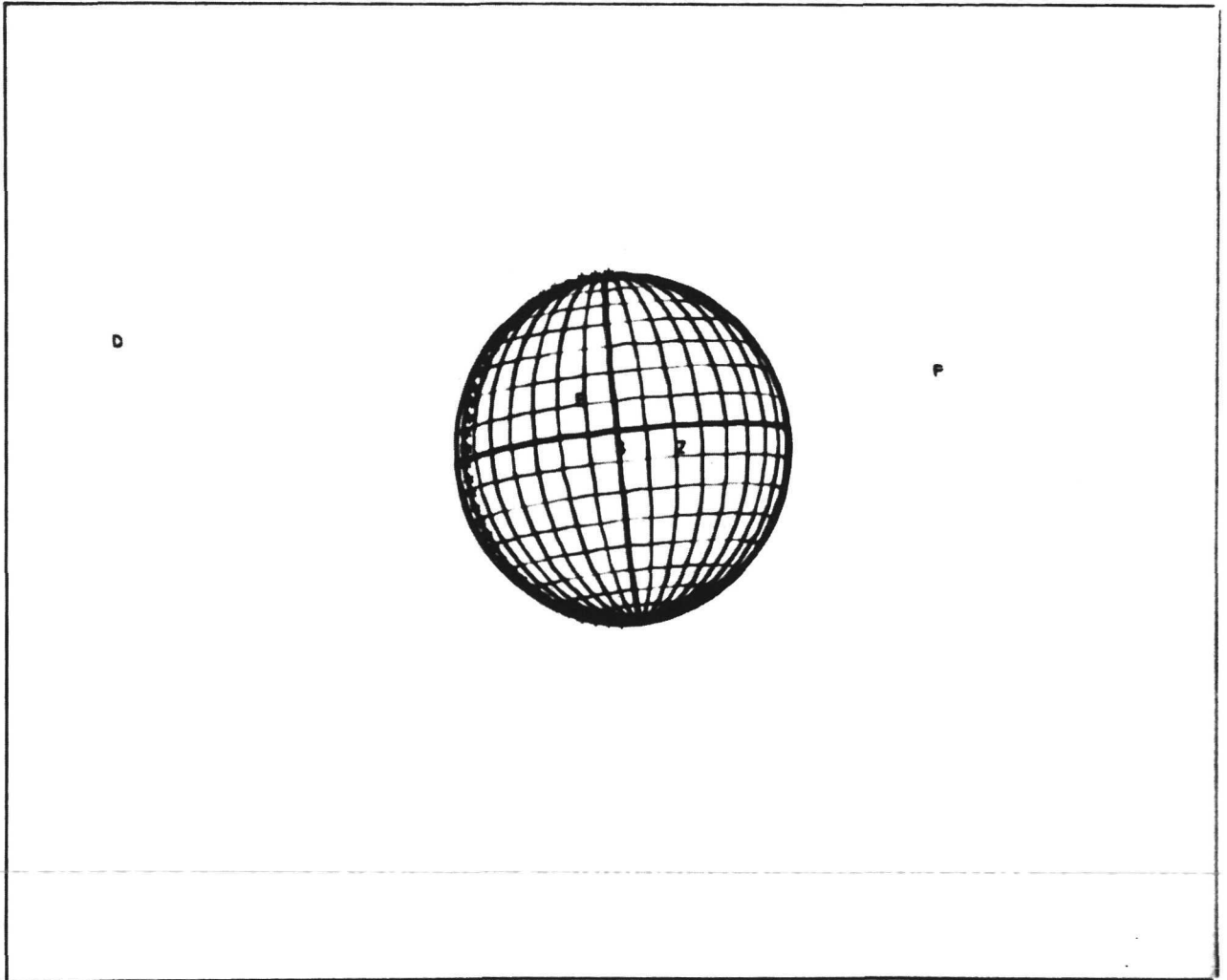
6 FE 17

SHUTTERED 29 JULY 15 hr 20 min 12.194 sec (GMT)

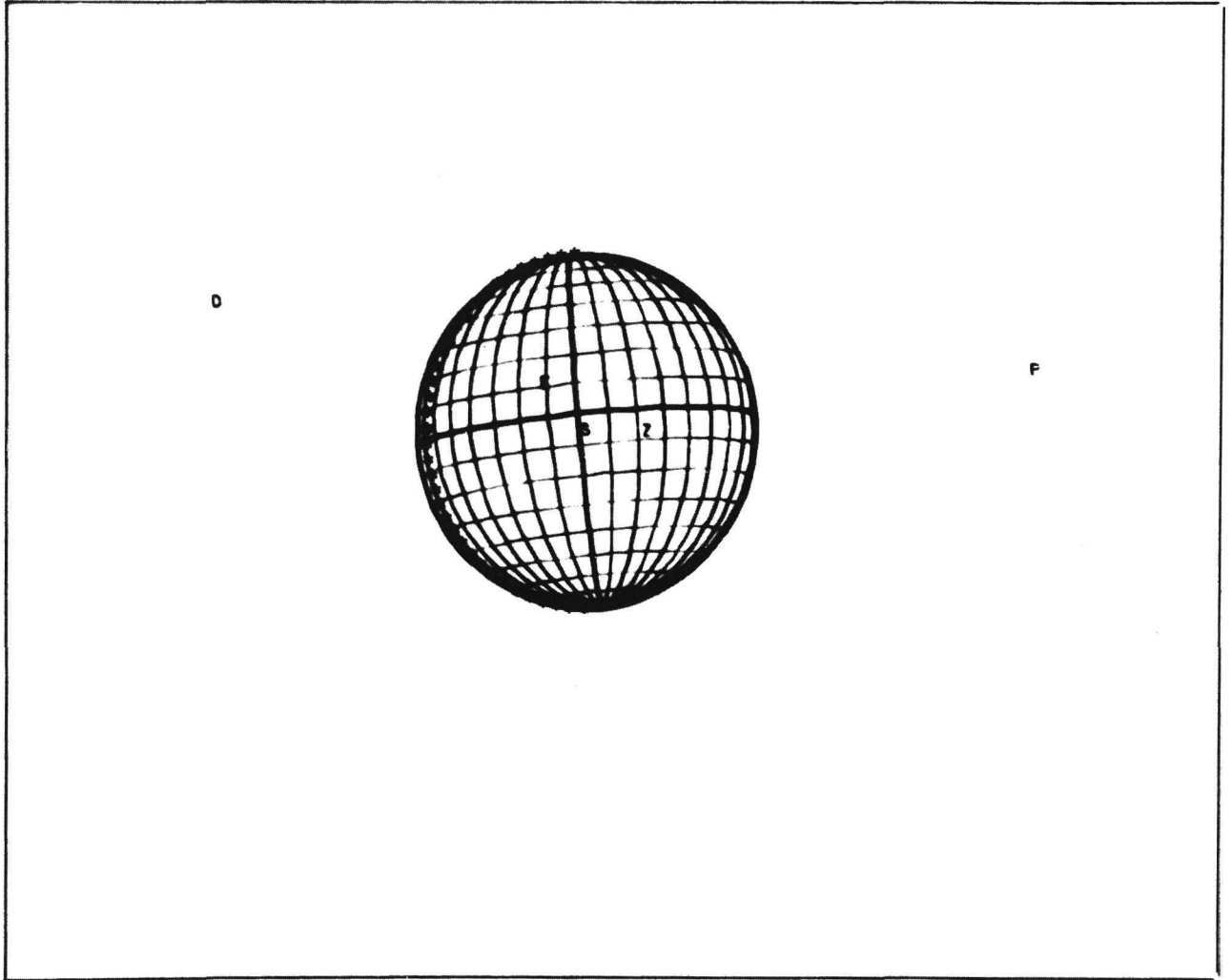
ENCOUNTER MINUS 37 hr 58 min 54.789 sec

S/C ALTITUDE 985,064 km, LONG. OF SUB-S/C POINT 116.29 deg EAST

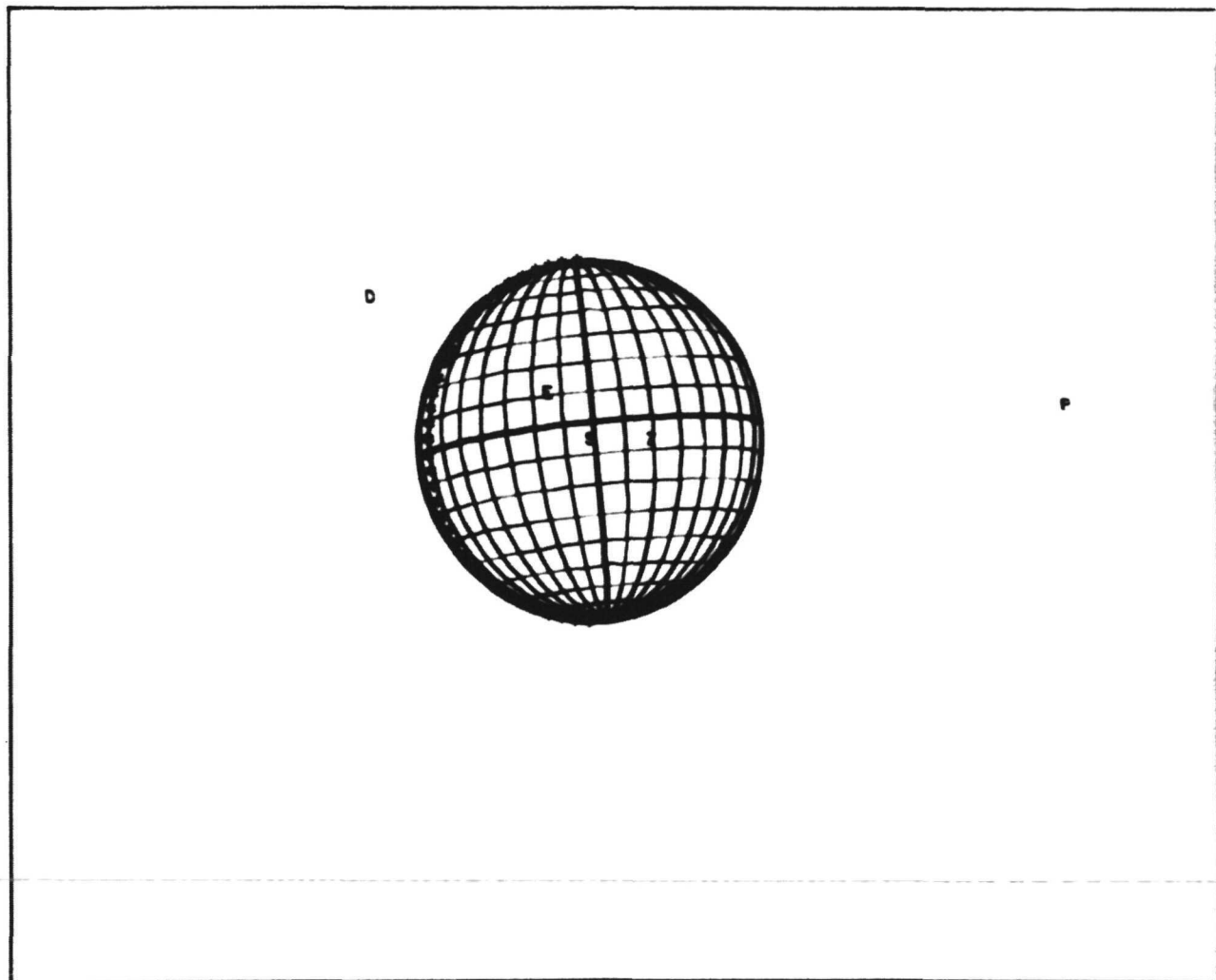
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 26.8 km



6 FE 18
SHUTTERED 29 JULY 15 hr 56 min 48.824 sec (GMT)
ENCOUNTER MINUS 37 hr 22 min 18.159 sec
S/C ALTITUDE 969,230 km, LONG. OF SUB-S/C POINT 107.38 deg EAST
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 26.4 km



6 FE 19
SHUTTERED 29 JULY 16 hr 34 min 49.942 sec (GMT)
ENCOUNTER MINUS 36 hr 44 min 19.041 sec
S/C ALTITUDE 952,788 km, LONG. OF SUB-S/C POINT 98.13 deg EAST
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 26.0 km



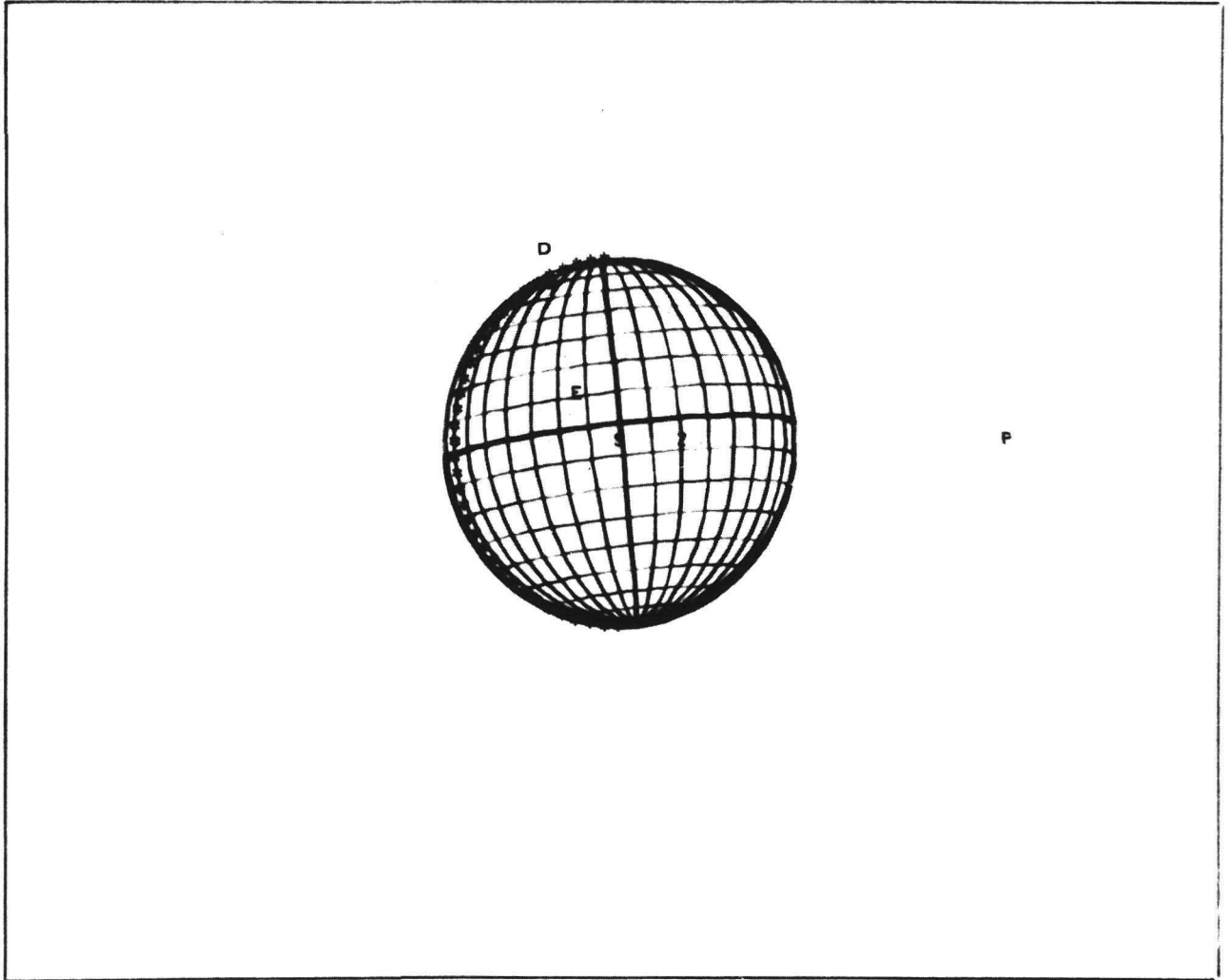
6 FE 20

SHUTTERED 29 JULY 17 hr 11 min 26.575 sec (GMT)

ENCOUNTER MINUS 36 hr 7 min 40.408 sec

S/C ALTITUDE 936,954 km, LONG. OF SUB-S/C POINT 89.22 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 25.6 km



6 FE 21

SHUTTERED 29 JULY 17 hr 48 min 3.208 sec (GMT)

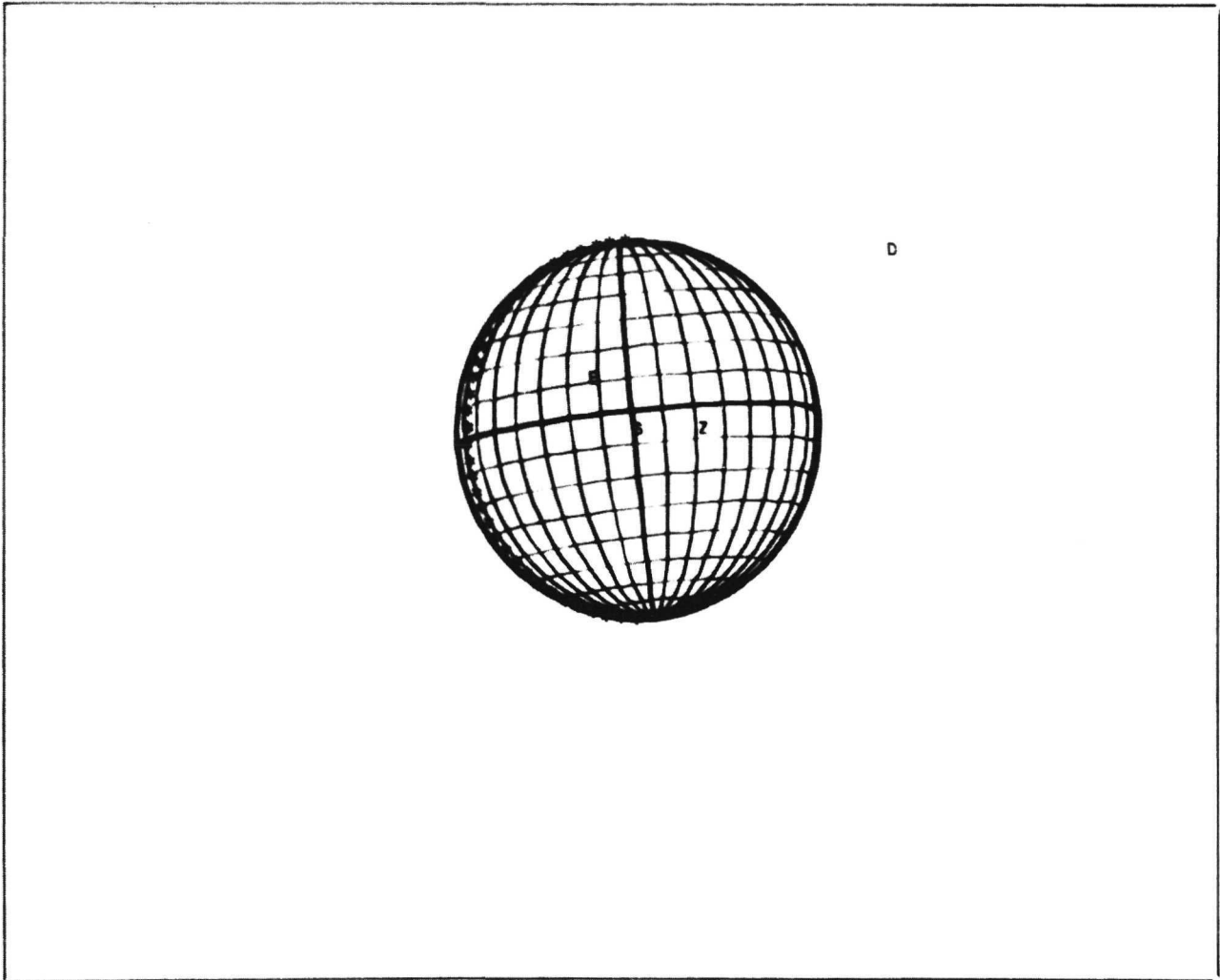
ENCOUNTER MINUS 35 hr 31 min 3.775 sec

S/C ALTITUDE 921, 121 km, LONG. OF SUB-S/C POINT 80.30 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 25.2 km



6 FE 22
SHUTTERED 29 JULY 18 hr 24 min 39.839 sec (GMT)
ENCOUNTER MINUS 34 hr 54 min 27.144 sec
S/C ALTITUDE 905,286 km, LONG. OF SUB-S/C POINT 71.39 deg EAST
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 24.7 km



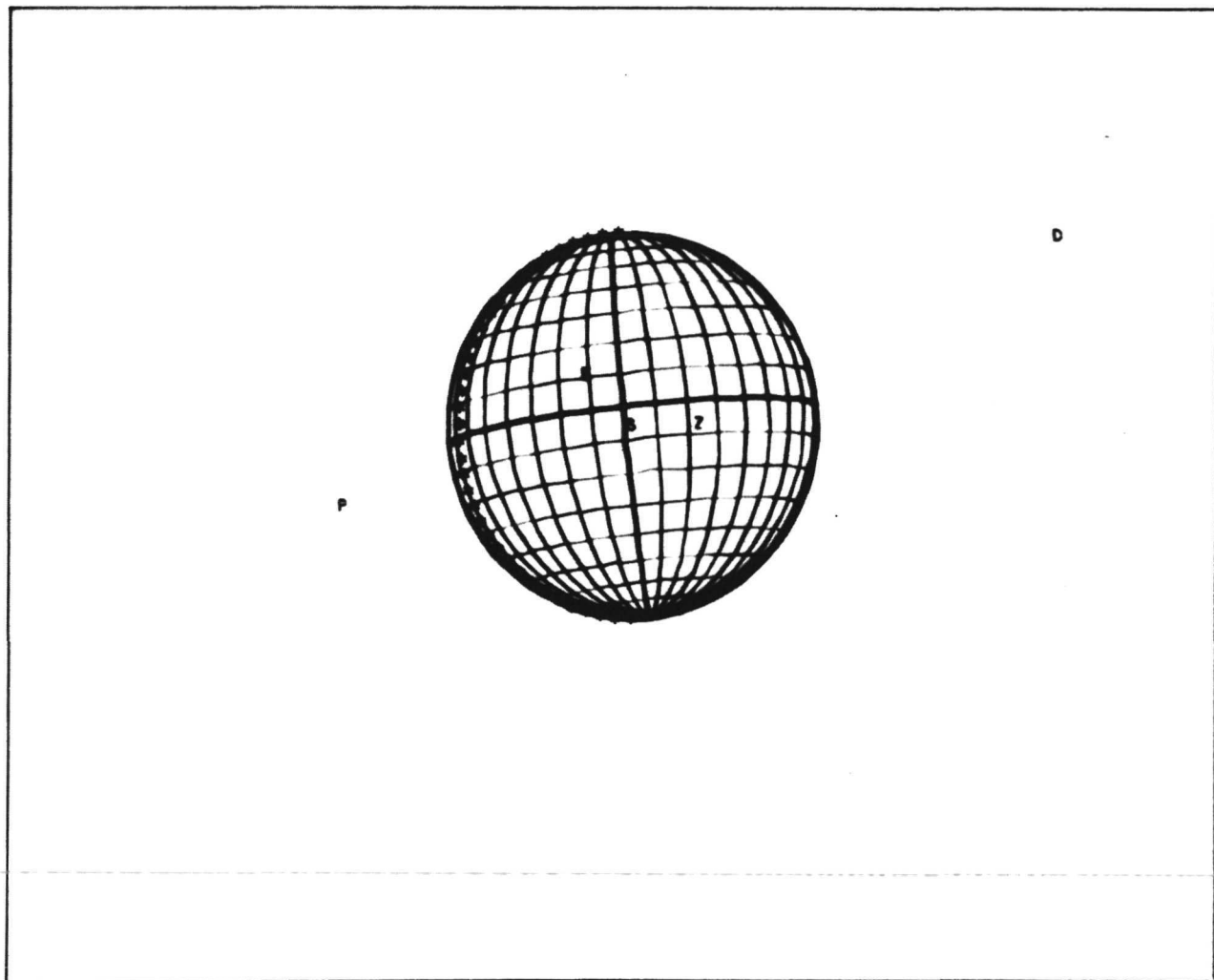
6 FE 23

SHUTTERED 29 JULY 19 hr 2 min 40.959 sec (GMT)

ENCOUNTER MINUS 34 hr 16 min 26.024 sec

S/C ALTITUDE 888,843 km, LONG. OF SUB-S/C POINT 62.14 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 24.3 km



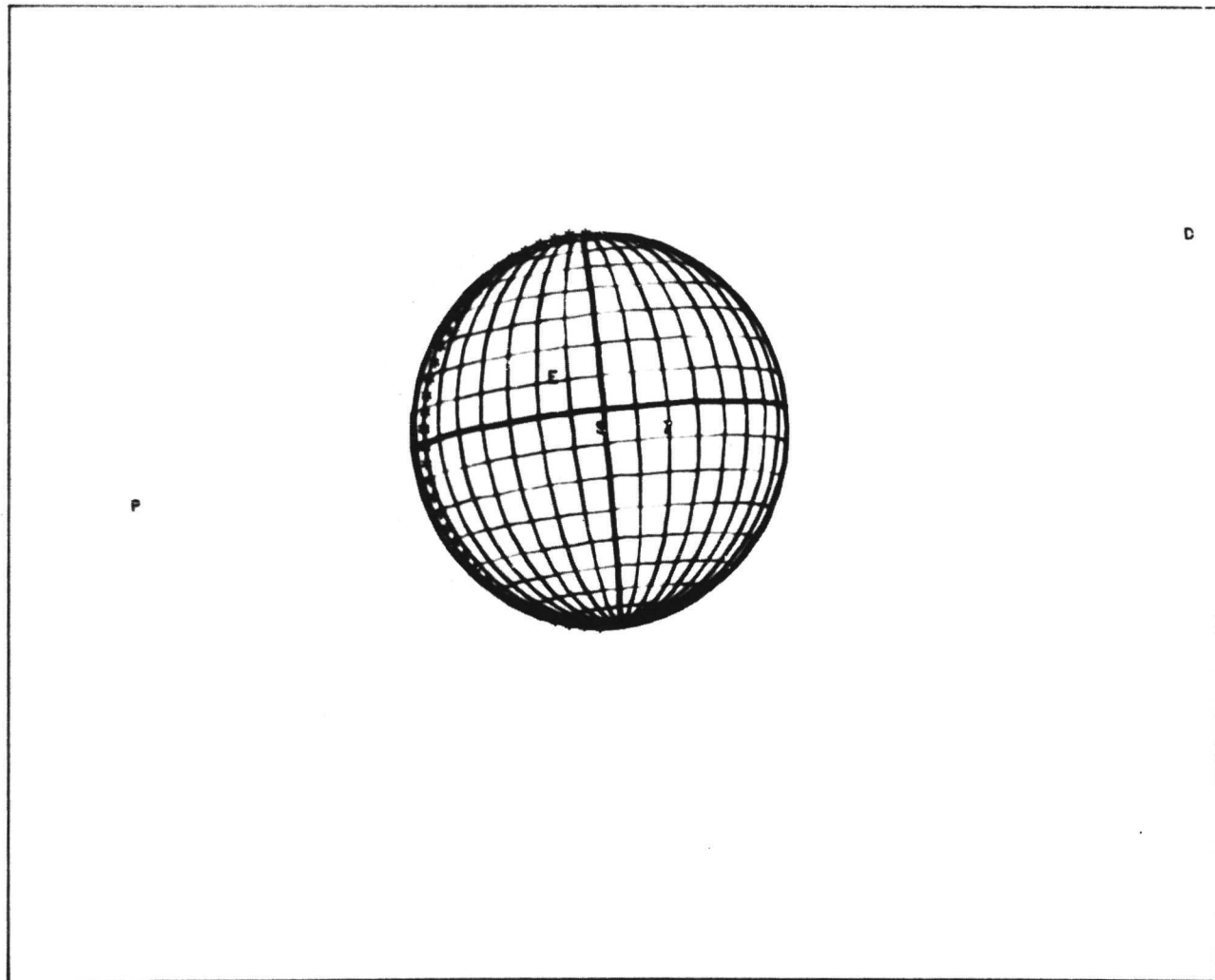
6 FE 24

SHUTTERED 29 JULY 19 hr 39 min 17.590 sec (GMT)

ENCOUNTER MINUS 33 hr 39 min 49.393 sec

S/C ALTITUDE 873,009 km, LONG. OF SUB-S/C POINT 53.23 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 23.8 km



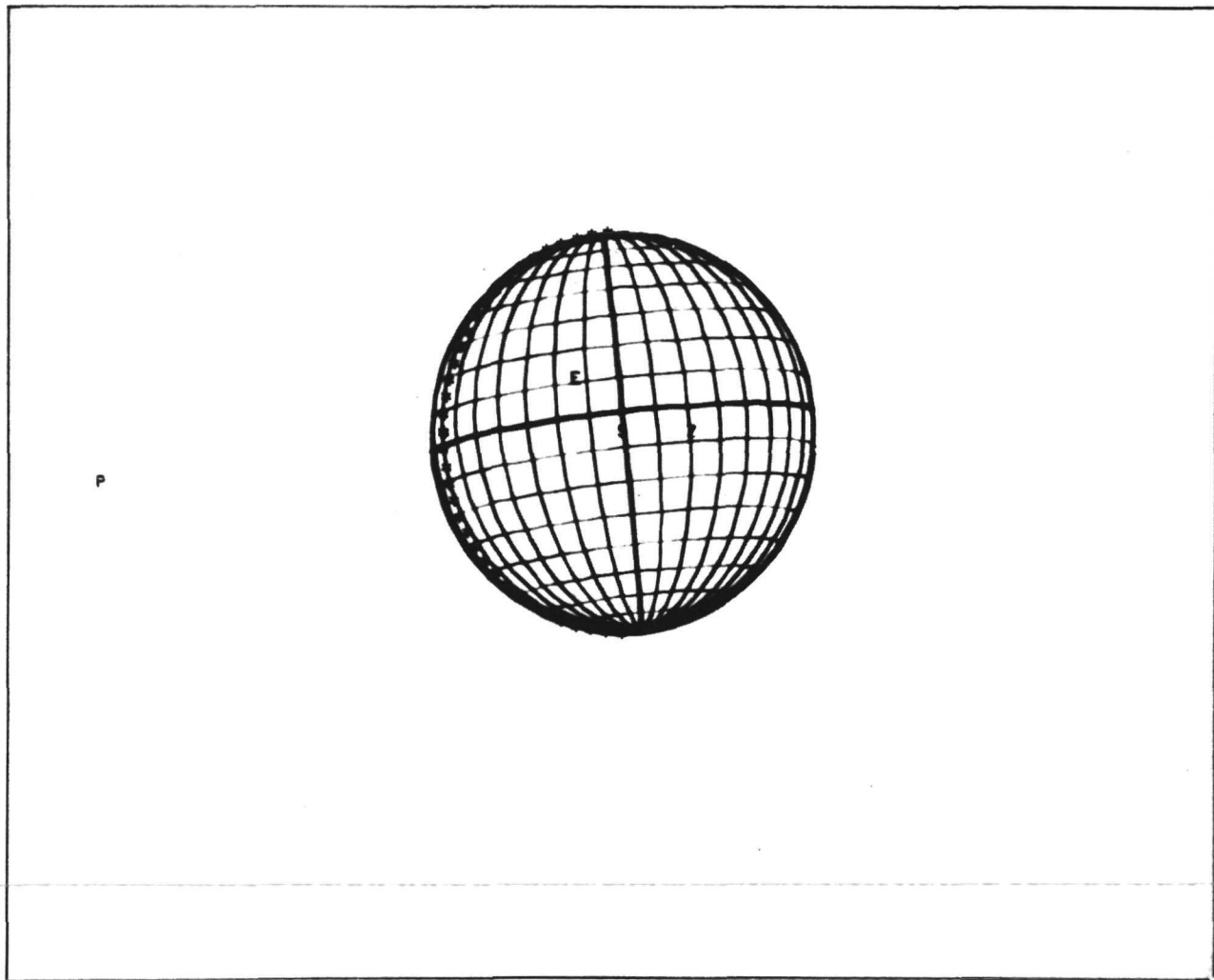
6 FE 25

SHUTTERED 29 JULY 20 hr 15 min 54.223 sec (GMT)

ENCOUNTER MINUS 33 hr 3 min 12.760 sec

S/C ALTITUDE 857,174 km, LONG. OF SUB-S/C POINT 44.32 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 23.4 km



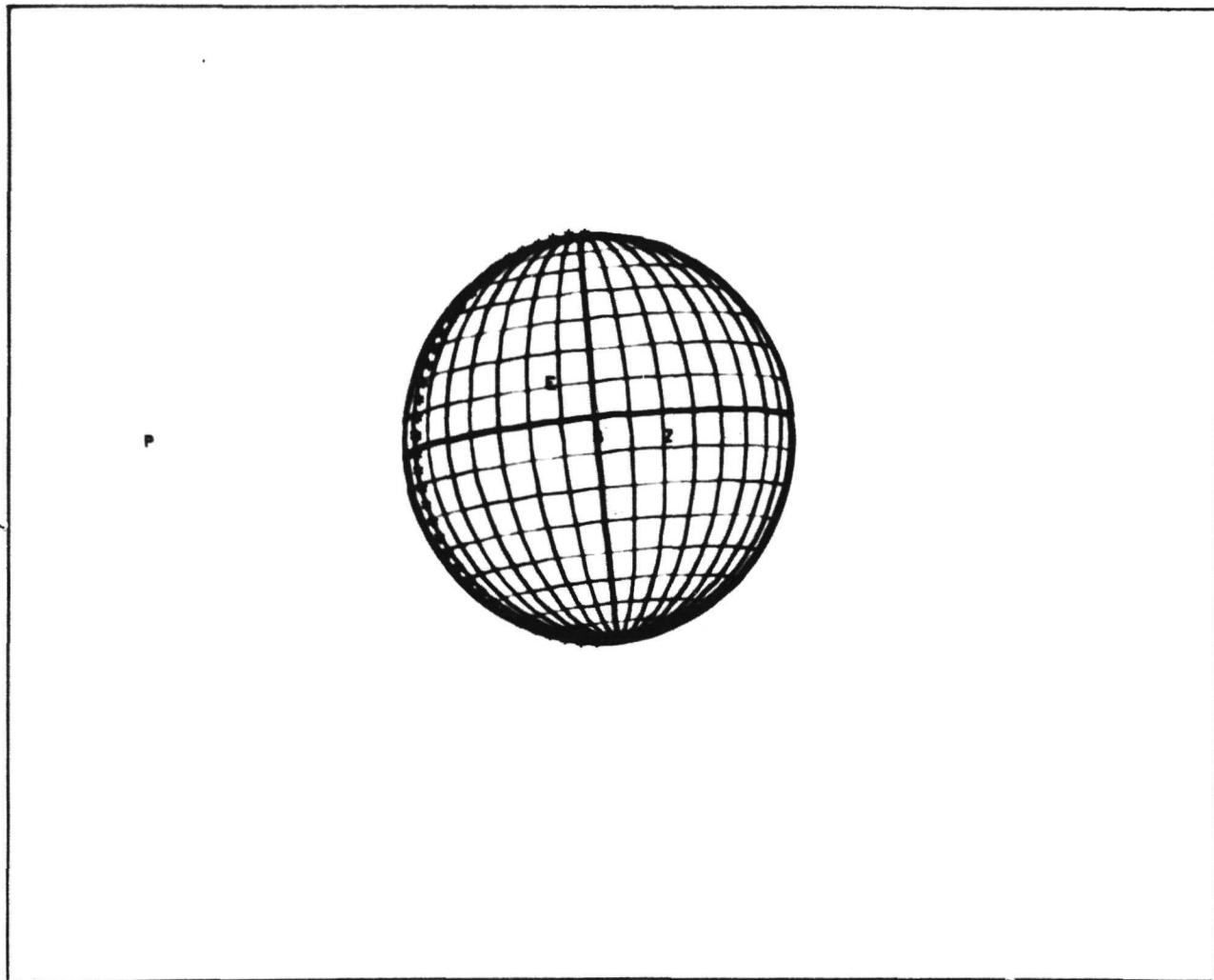
6 FE 26

SHUTTERED 29 JULY 20 hr 52 min 30.855 sec (GMT)

ENCOUNTER MINUS 32 hr 26 min 36.128 sec

S/C ALTITUDE 841,340 km, LONG. OF SUB-S/C POINT 35.41 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 23.0 km



6 FE 27

SHUTTERED 29 JULY 21 hr 30 min 31.973 sec (GMT)

ENCOUNTER MINUS 31 hr 48 min 35.010 sec

S/C ALTITUDE 824,896 km, LONG. OF SUB-S/C POINT 26.16 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 22.6 km



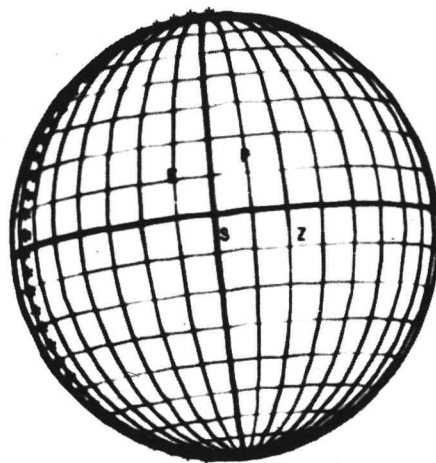
6 FE 28

SHUTTERED 29 JULY 22 hr 7 min 8.606 sec (GMT)

ENCOUNTER MINUS 31 hr 11 min 58.377 sec

S/C ALTITUDE 809,062 km, LONG. OF SUB-S/C POINT 17.25 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 22.1 km



6 FE 29

SHUTTERED 29 JULY 22 hr 43 min 45.238 sec (GMT)

ENCOUNTER MINUS 30 hr 35 min 21.745 sec

S/C ALTITUDE 793,226 km, LONG. OF SUB-S/C POINT 8.34 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 21.7 km



6 FE 30

SHUTTERED 29 JULY 23 hr 21 min 46.357 sec (GMT)

ENCOUNTER MINUS 29 hr 57 min 20.626 sec

S/C ALTITUDE 776,782 km, LONG. OF SUB-S/C POINT 359.09 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 21.2 km



6 FE 31

SHUTTERED 29 JULY 23 hr 58 min 22.988 sec (GMT)

ENCOUNTER MINUS 29 hr 20 min 43.995 sec

S/C ALTITUDE 760,946 km, LONG. OF SUB-S/C POINT 350.18 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 20.8 km



6 FE 32

SHUTTERED 30 JULY 0 hr 35 min 6.458 sec (GMT)

ENCOUNTER MINUS 28 hr 44 min 0.525 sec

S/C ALTITUDE 745,061 km, LONG. OF SUB-S/C POINT 341.25 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 20.4 km



6 FE 33

SHUTTERED 30 JULY 1 hr 11 min 36.254 sec (GMT)

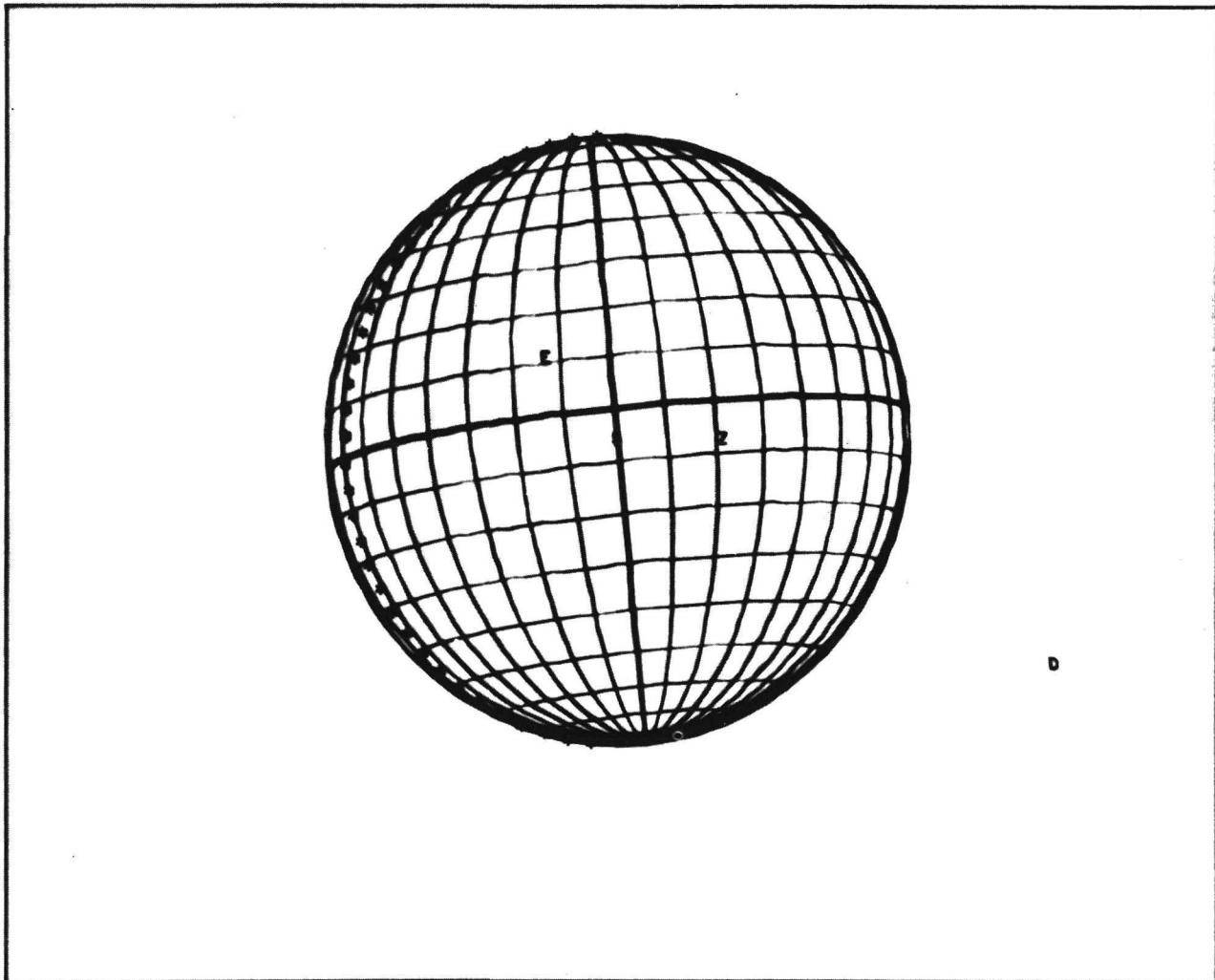
ENCOUNTER MINUS 28 hr 7 min 30.729 sec

S/C ALTITUDE 729,274 km, LONG. OF SUB-S/C POINT 332.37 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 19.9 km



6 FE 34
SHUTTERED 30 JULY 7 hr 31 min 47.436 sec (GMT)
ENCOUNTER MINUS 21 hr 47 min 19.547 sec
S/C ALTITUDE 564,803 km, LONG. OF SUB-S/C POINT 239.90 deg EAST
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 15.4 km



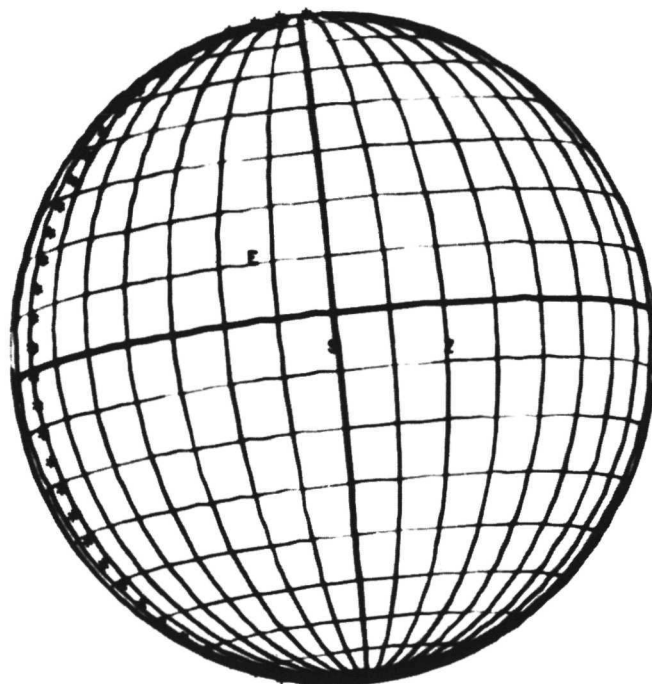
6 FE 35

SHUTTERED 30 JULY 8 hr 36 min 33.786 sec (GMT)

ENCOUNTER MINUS 20 hr 42 min 33.197 sec

S/C ALTITUDE 536,777 km, LONG. OF SUB-S/C POINT 224.16 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 14.7 km



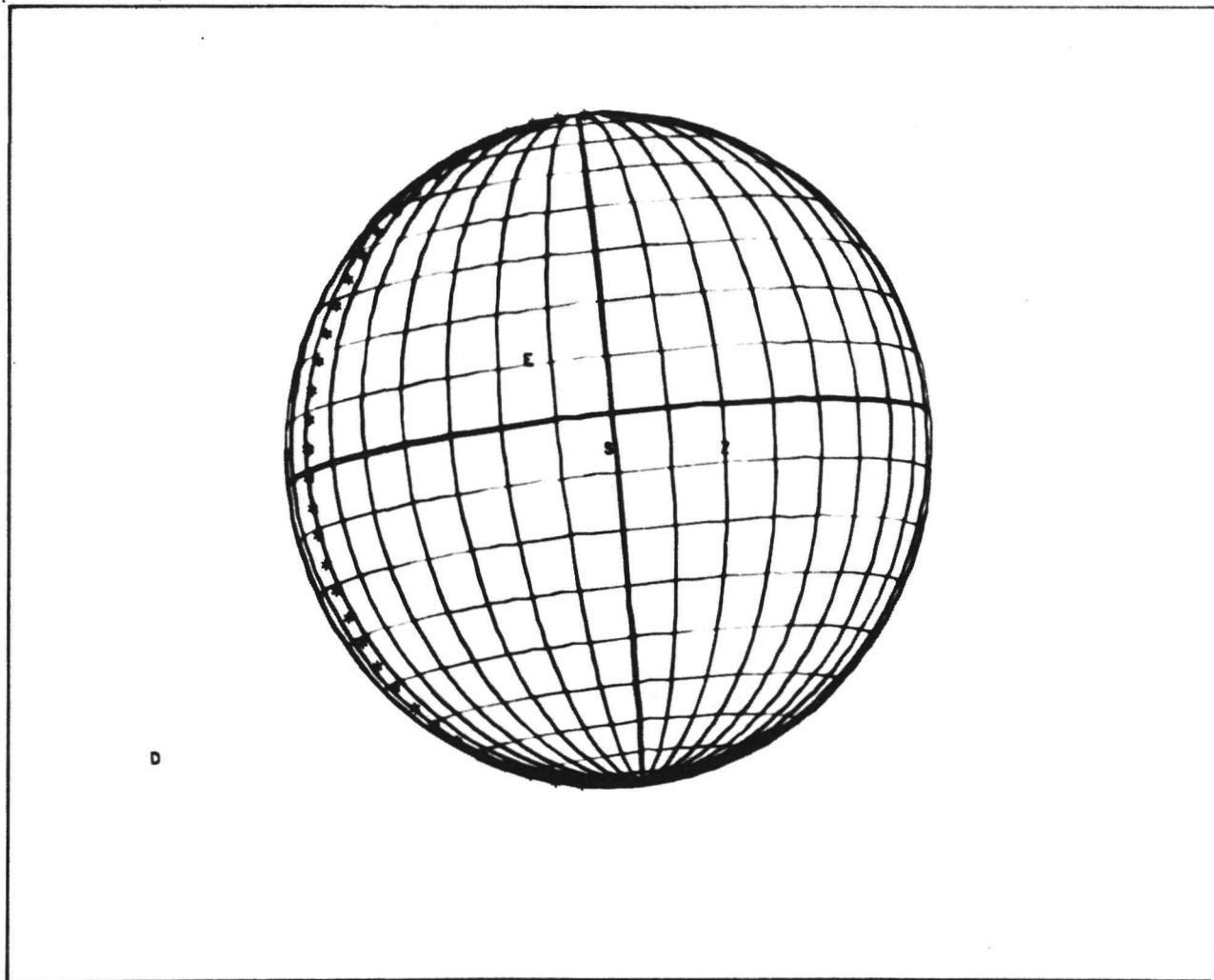
6 FE 36

SHUTTERED 30 JULY 9 hr 39 min 55.649 sec (GMT)

ENCOUNTER MINUS 19 hr 39 min 11.334 sec

S/C ALTITUDE 509,359 km, LONG. OF SUB-S/C POINT 208.76 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 13.9 km



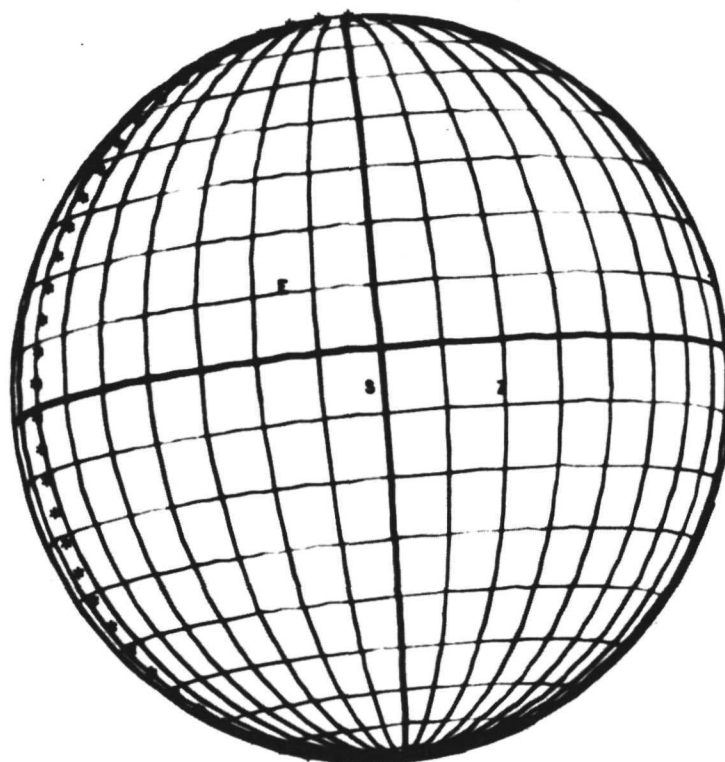
6 FE 37

SHUTTERED 30 JULY 10 hr 44 min 41.999 sec (GMT)

ENCOUNTER MINUS 18 hr 34 min 14.984 sec

S/C ALTITUDE 481,330 km, LONG. OF SUB-S/C POINT 193.02deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 13.1 km



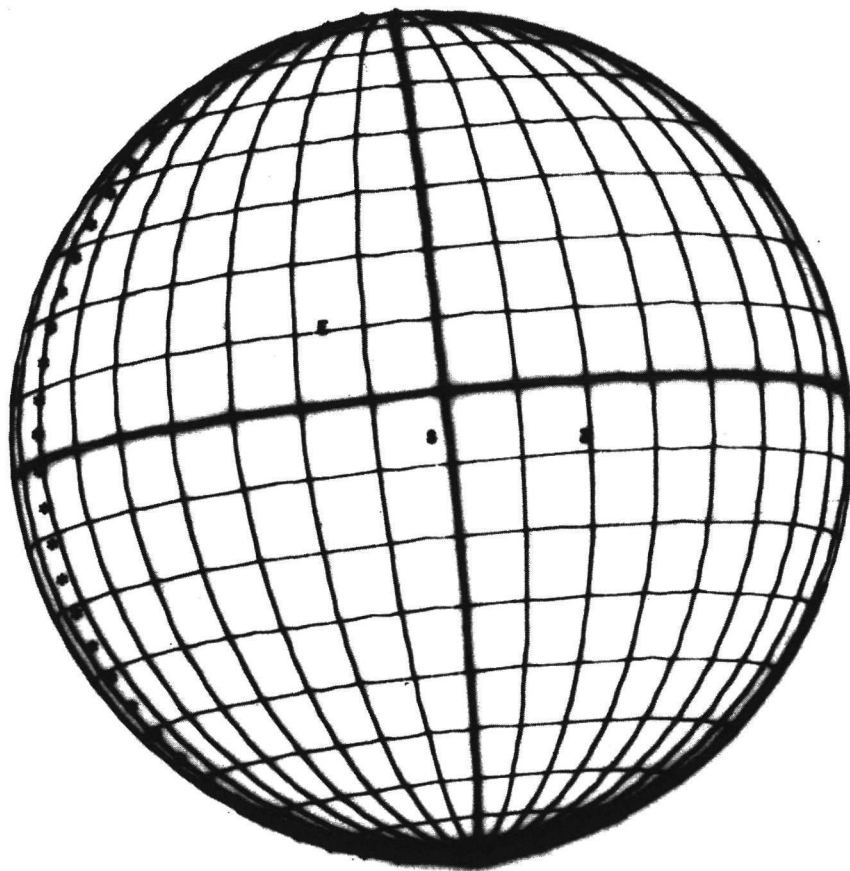
6 FE 38

SHUTTERED 30 JULY 11 hr 48 min 3.862 sec (GMT)

ENCOUNTER MINUS 17 hr 31 min 3.121 sec

S/C ALTITUDE 453,908 km, LONG. OF SUB-S/C POINT 177.63 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 12.4 km



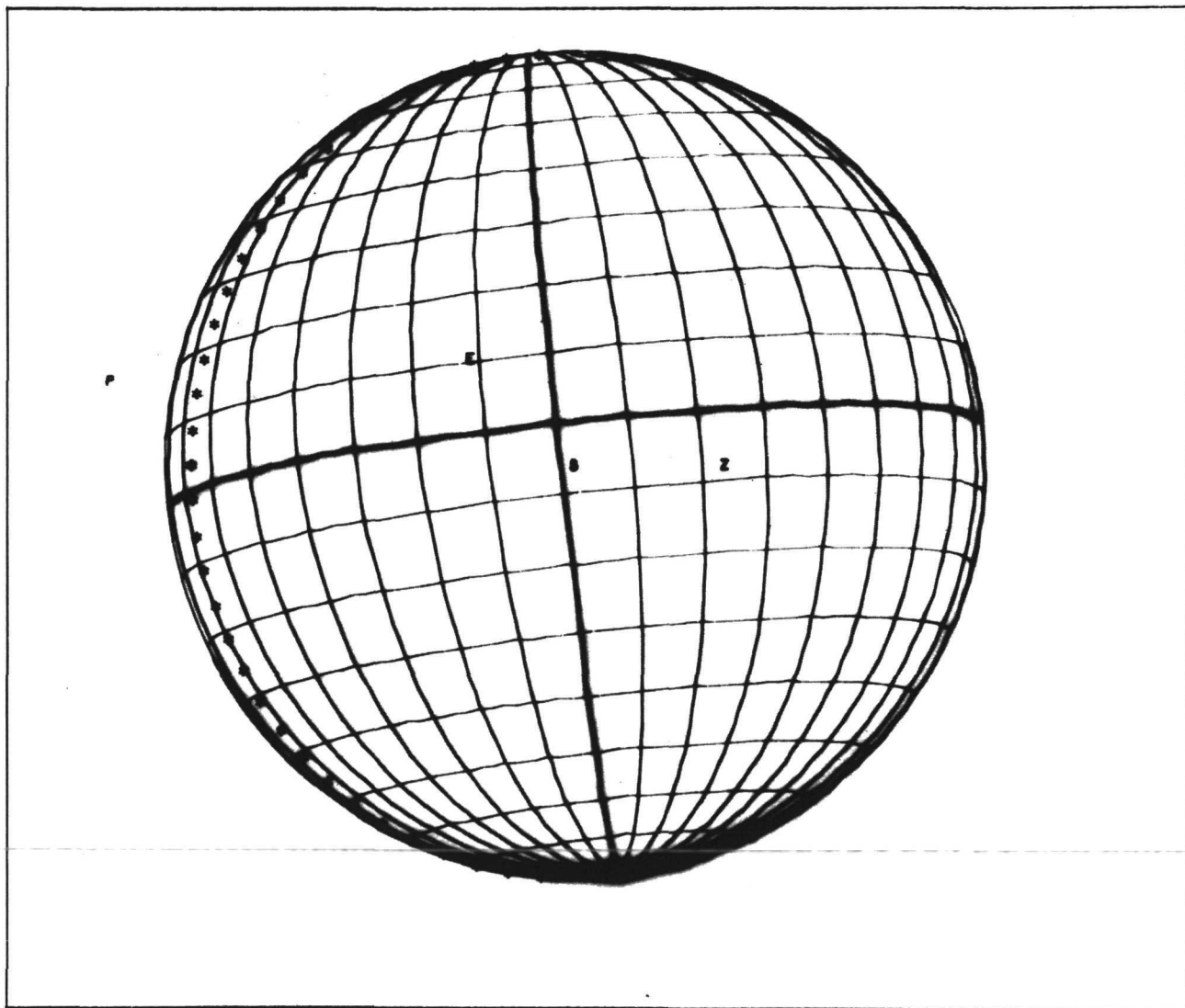
6 FE 39

SHUTTERED 30 JULY 12 hr 52 min 50.211 sec (GMT)

ENCOUNTER MINUS 16 hr 26 min 16.772 sec

S/C ALTITUDE 425,874 km, LONG. OF SUB-S/C POINT 161.91 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 11.6 km



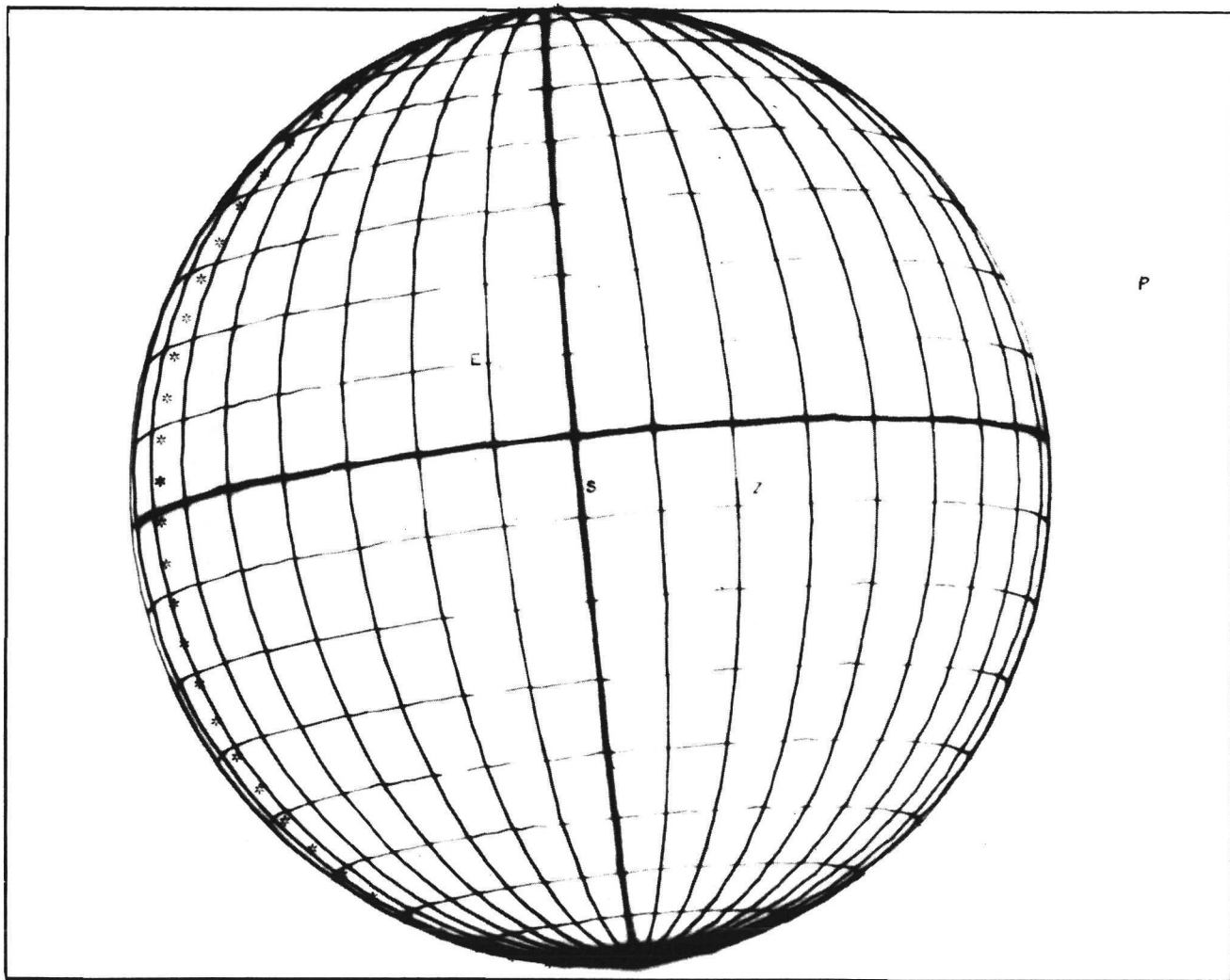
6 FE 40

SHUTTERED 30 JULY 13 hr 56 min 12.075 sec (GMT)

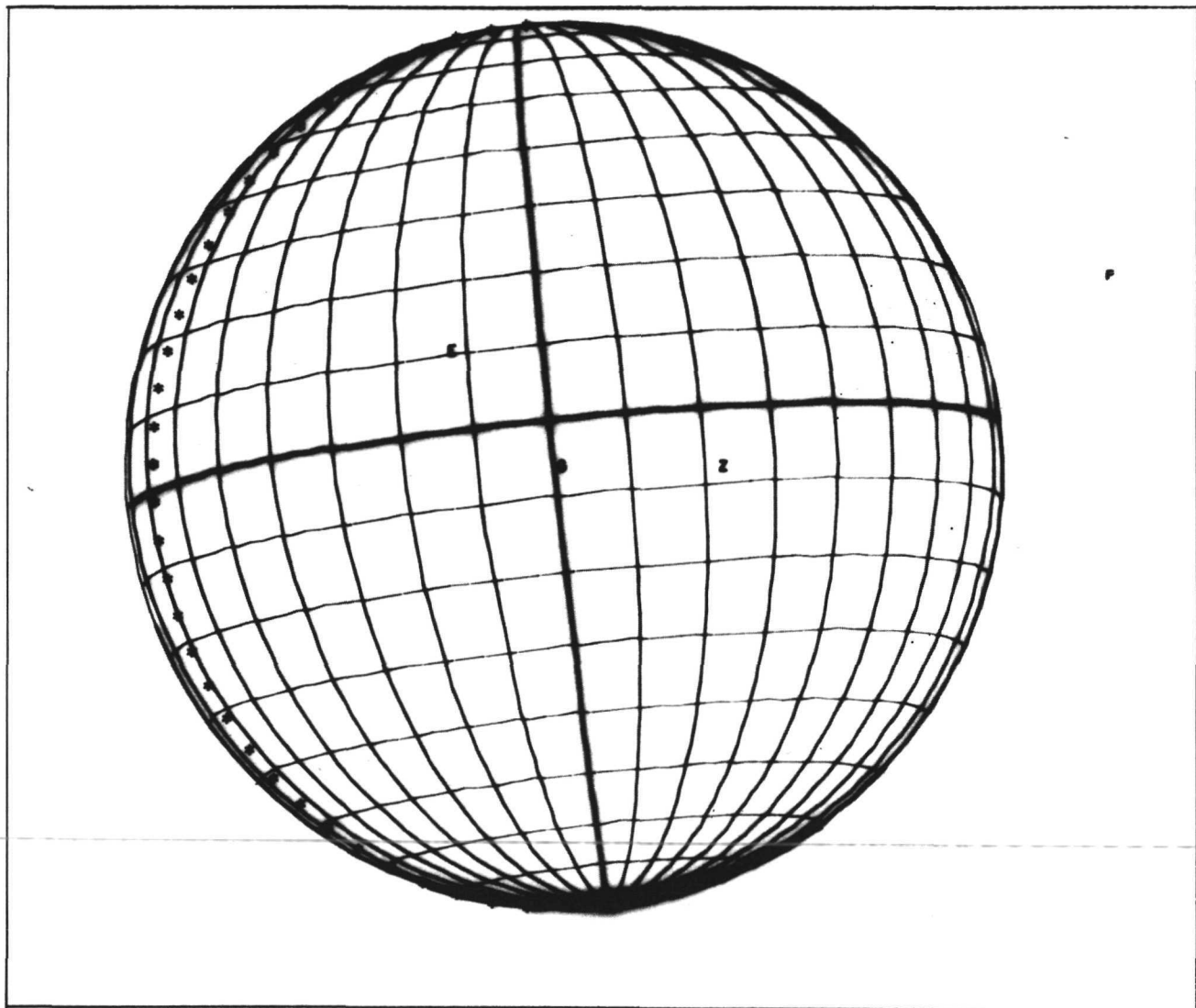
ENCOUNTER MINUS 15 hr 52 min 29.111 sec

S/C ALTITUDE 398,447 km, LONG. OF SUB-S/C POINT 146.53 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 10.9 km



6 FE 41
SHUTTERED 30 JULY 13 hr 57 min 36.561 sec (GMT)
ENCOUNTER MINUS 15 hr 21 min 30.422 sec
S/C ALTITUDE 397,837 km, LONG. OF SUB-S/C POINT 146.19 deg EAST
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 10.9 km



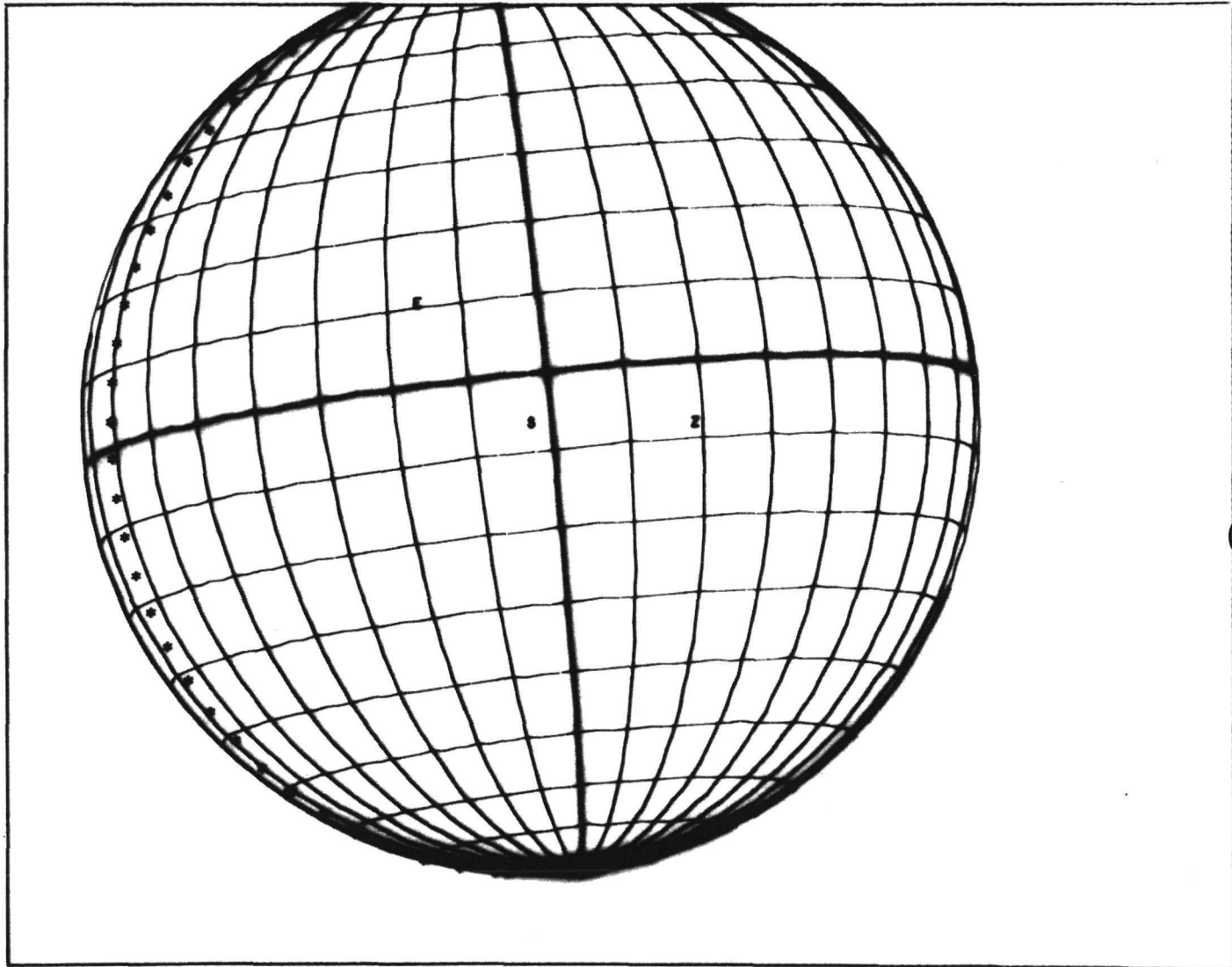
6 FE 42

SHUTTERED 30 JULY 14 hr 53 min 55.995 sec (GMT)

ENCOUNTER MINUS 14 hr 25 min 10.988 sec

S/C ALTITUDE 373,455 km, LONG. OF SUB-S/C POINT 132.53 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 10.2 km



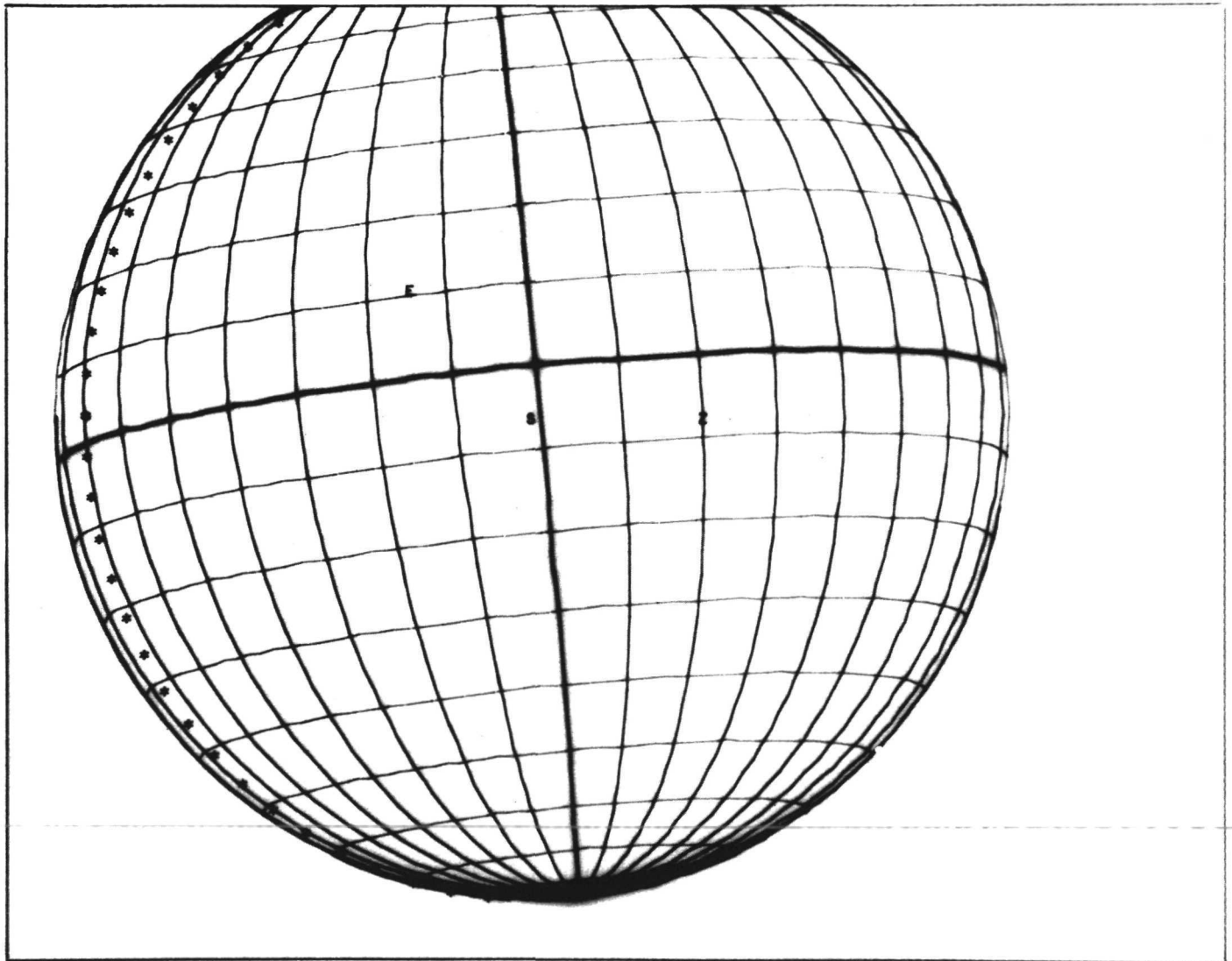
6 FE 43

SHUTTERED 30 JULY 15 hr 50 min 15.430 sec (GMT)

ENCOUNTER MINUS 13 hr 28 min 51.553 sec

S/C ALTITUDE 349,070 km, LONG. OF SUB-S/C POINT 118.88 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 9.5 km



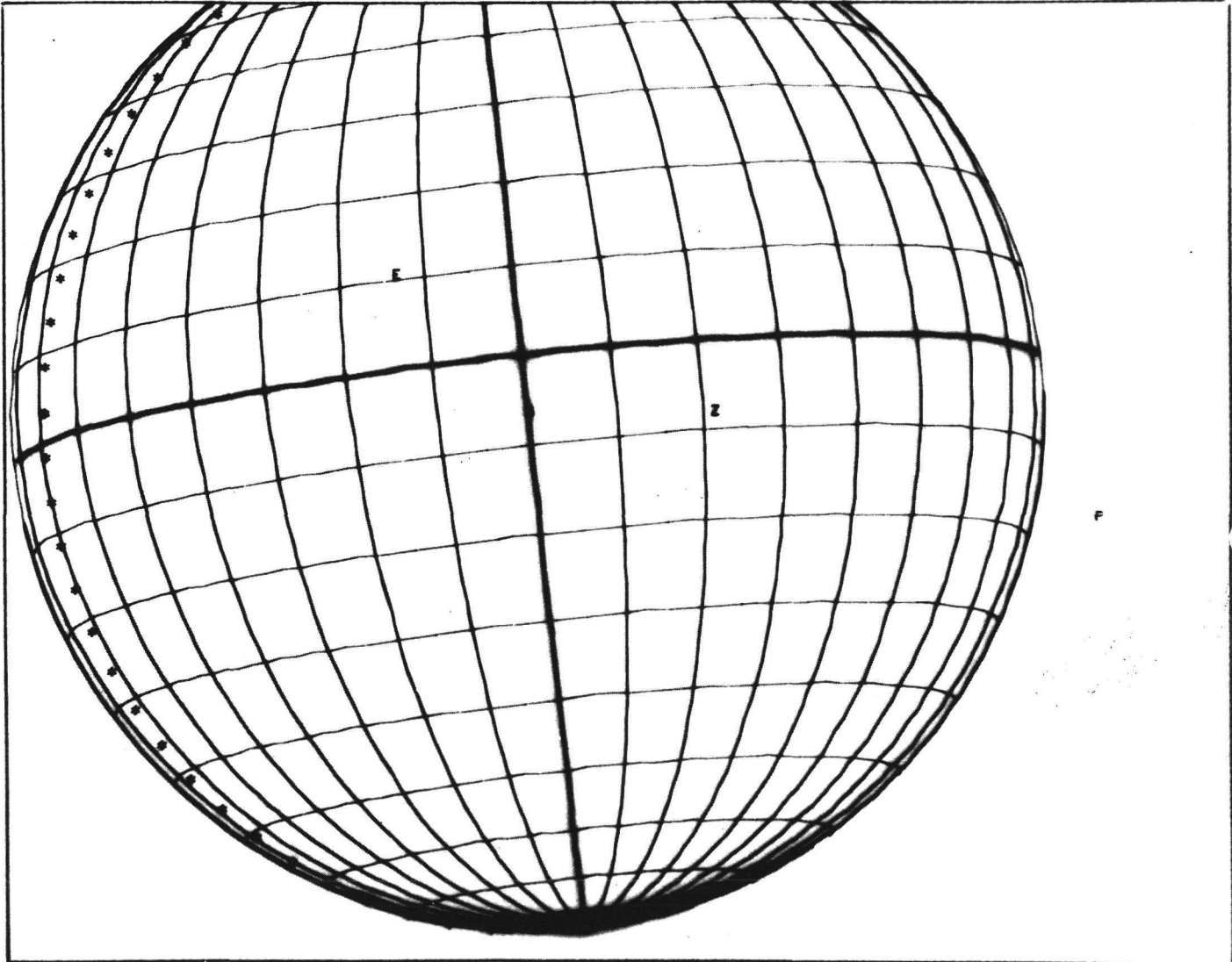
6 FE 44

SHUTTERED 30 JULY 16 hr 46 min 34.864 sec (GMT)

ENCOUNTER MINUS 12 hr 32 min 32.119 sec

S/C ALTITUDE 324,682 km, LONG. OF SUB-S/C POINT 105.24 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 8.8 km



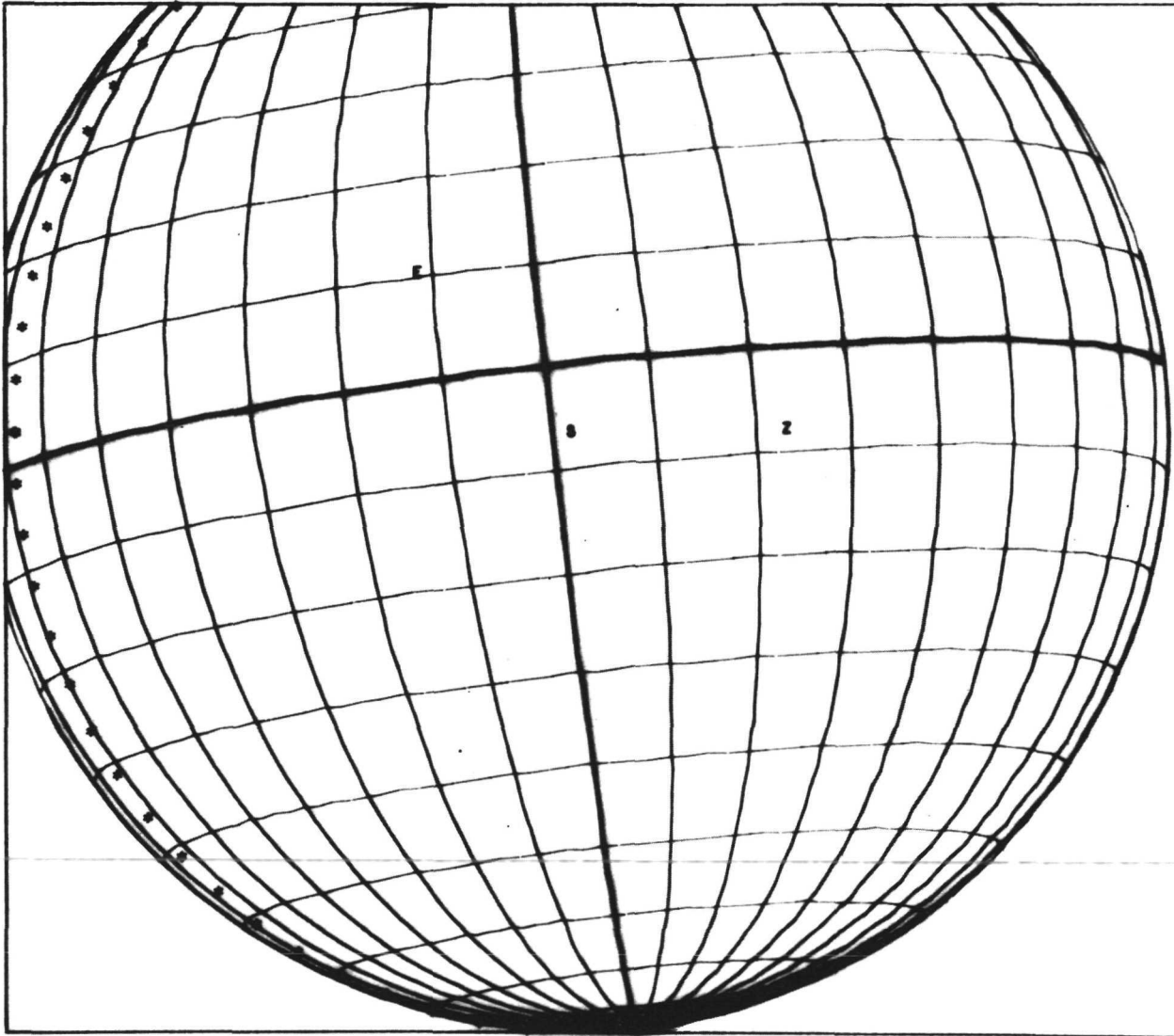
6 FE 45

SHUTTERED 30 JULY 17 hr 41 min 29.813 sec (GMT)

ENCOUNTER MINUS 11 hr 37 min 37.170 sec

S/C ALTITUDE 300,900 km, LONG. OF SUB-S/C POINT 91.95 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 8.2 km



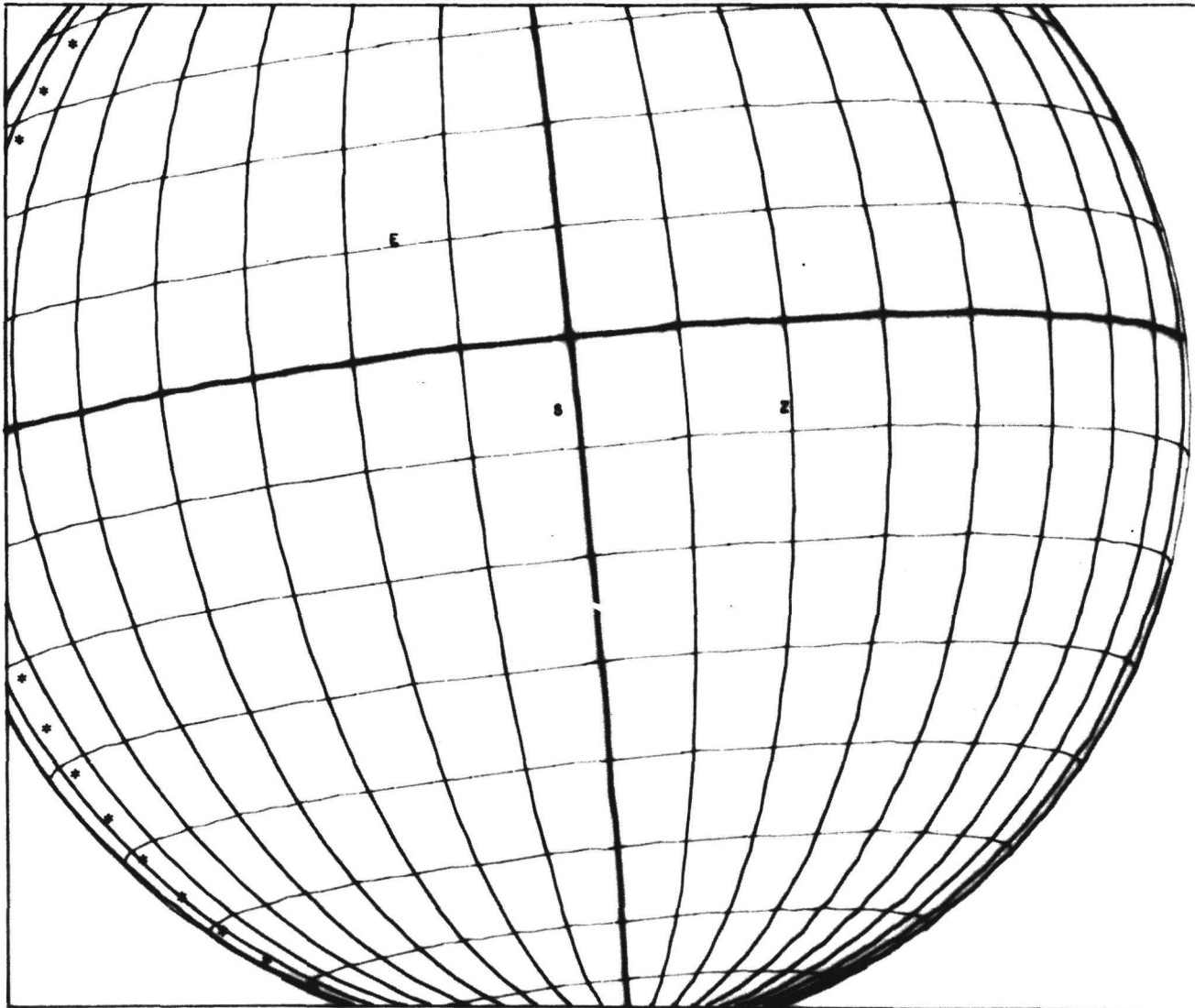
6 FE 46

SHUTTERED 30 JULY 18 hr 37 min 49.247 sec (GMT)

ENCOUNTER MINUS 10 hr 41 min 17.736 sec

S/C ALTITUDE 276,504 km, LONG. OF SUB-S/C POINT 78.34 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 7.5 km



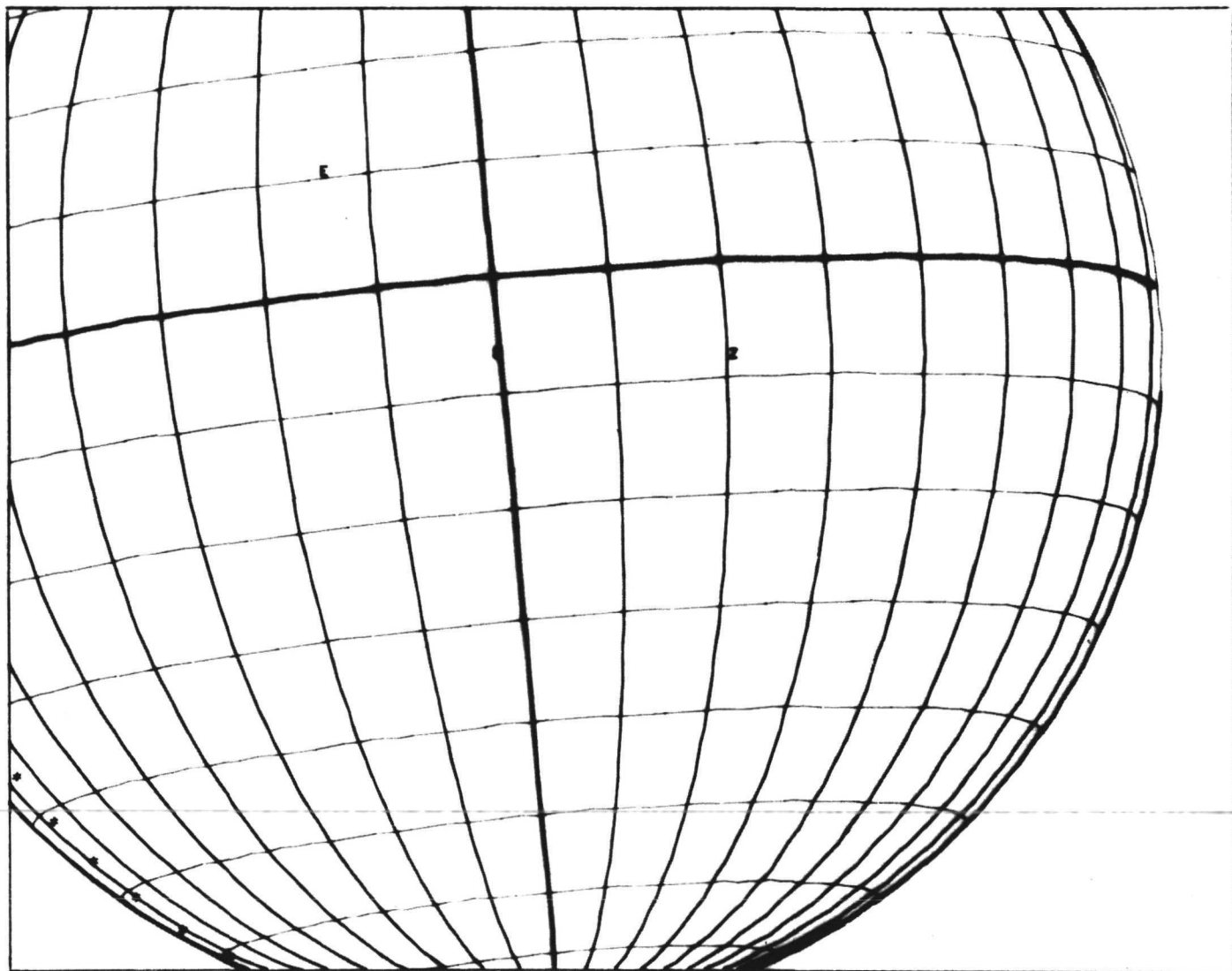
6 FE 47

SHUTTERED 30 JULY 19 hr 34 min 8.681 sec (GMT)

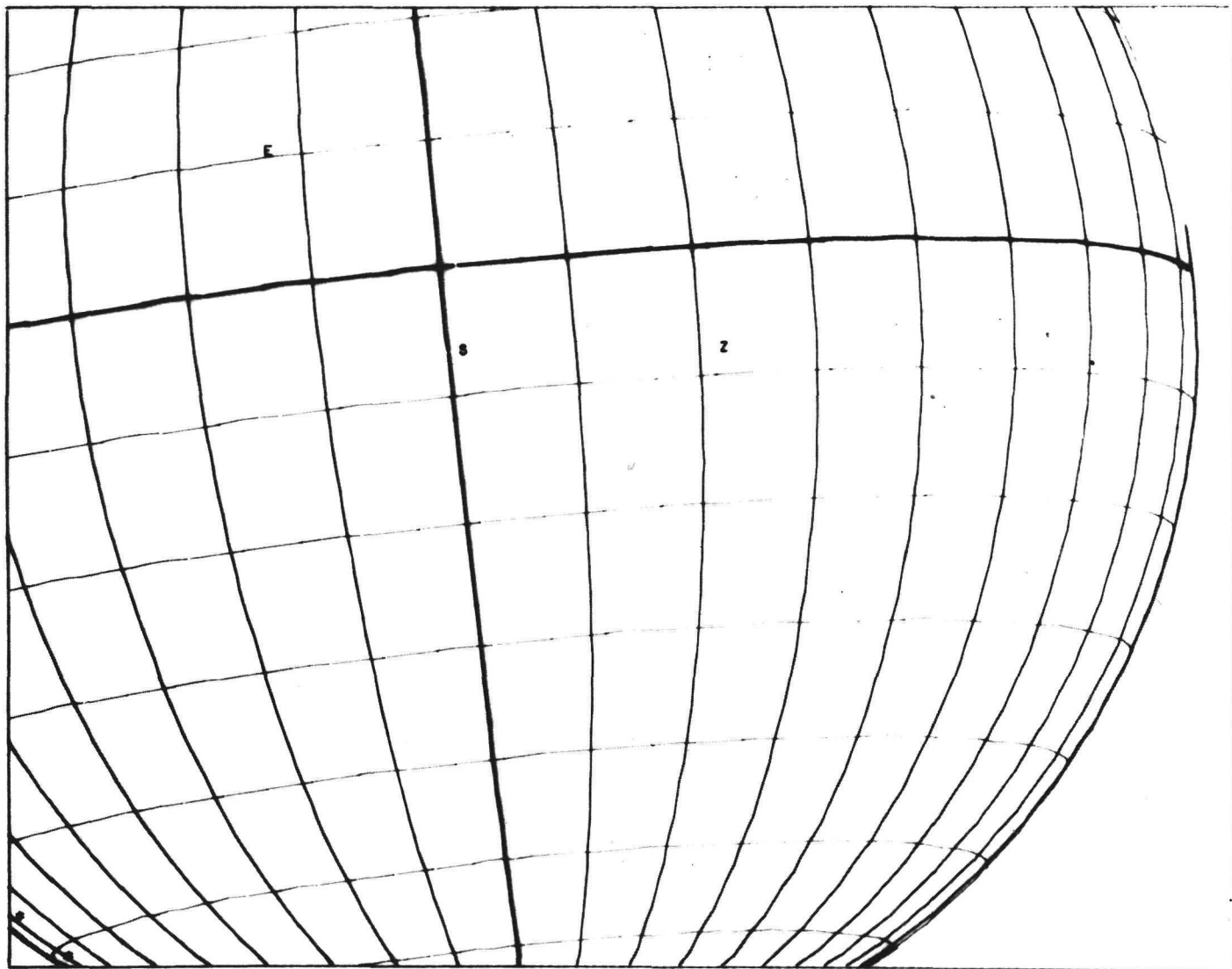
ENCOUNTER MINUS 9 hr 44 min 58.302 sec

S/C ALTITUDE 252,105 km, LONG. OF SUB-S/C POINT 64.76 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 6.9 km



6 FE 48
SHUTTERED 30 JULY 20 hr 30 min 28.116 sec (GMT)
ENCOUNTER MINUS 8 hr 48 min 38.867 sec
S/C ALTITUDE 227,699 km, LONG. OF SUB-S/C POINT 51.20 deg EAST
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 6.2 km



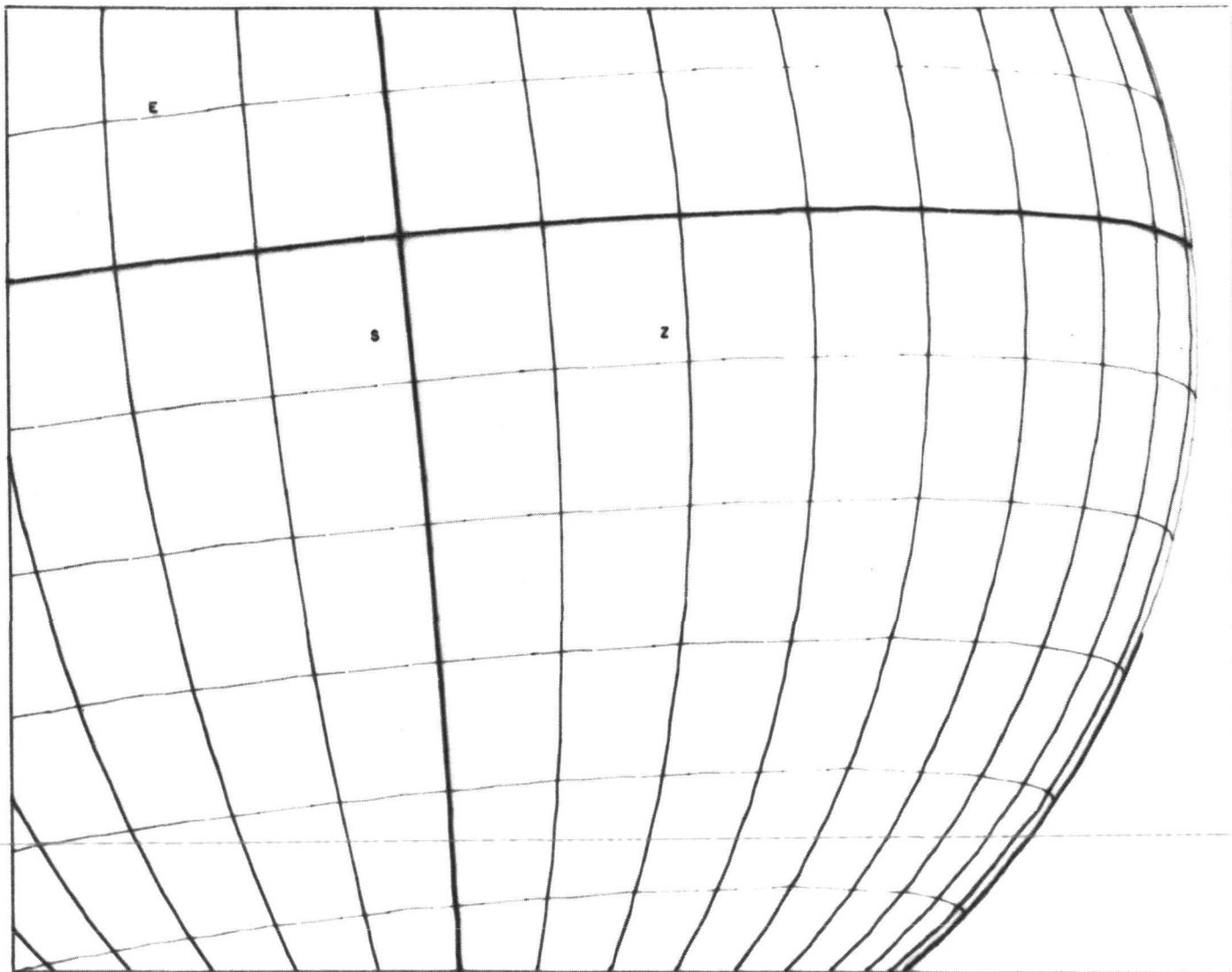
6 FE 49

SHUTTERED 30 JULY 21 hr 26 min 47.550 sec (GMT)

ENCOUNTER MINUS 7 hr 52 min 19.433 sec

S/C ALTITUDE 203,287 km, LONG. OF SUB-S/C POINT 37.68 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 5.5 km



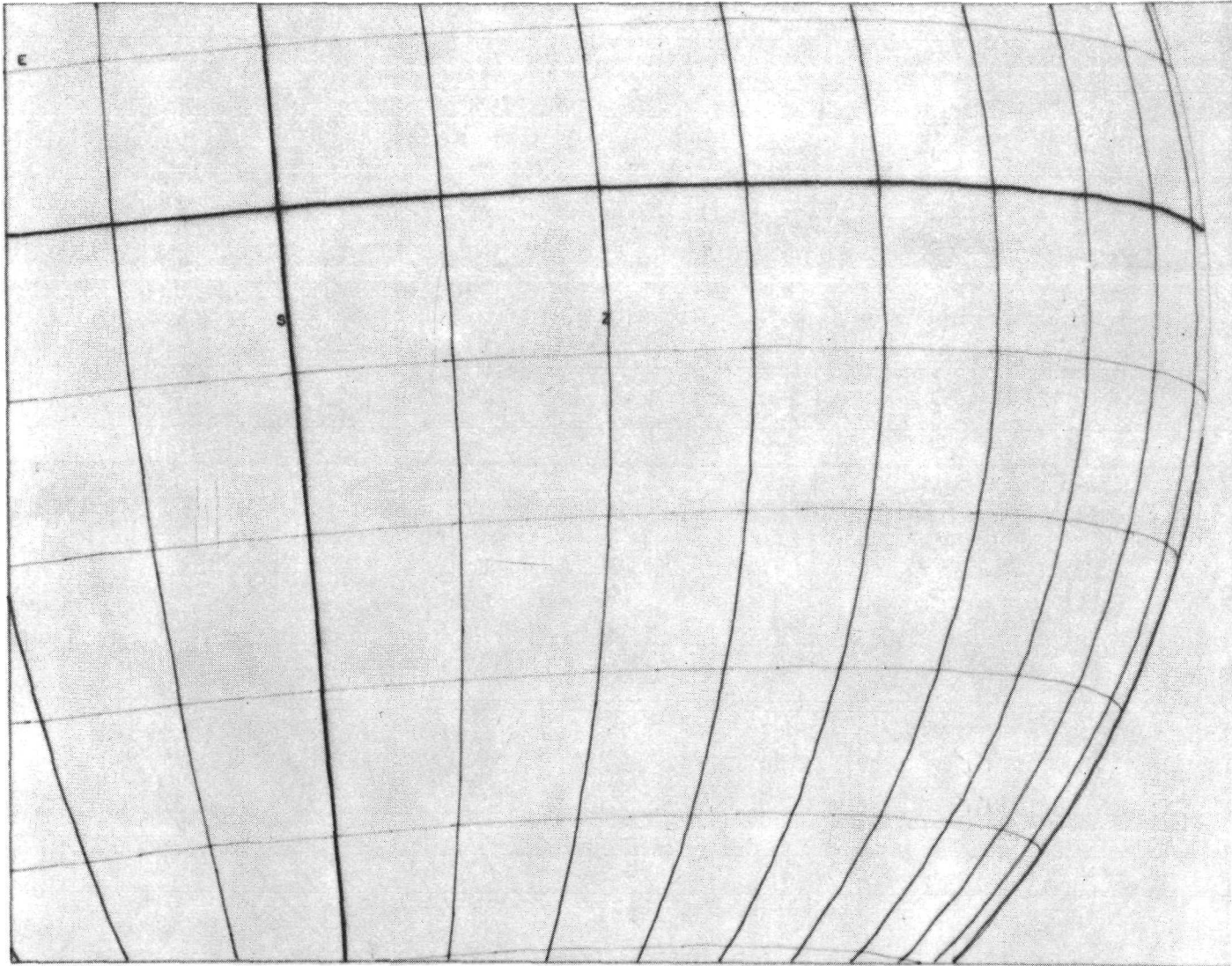
6 FE 50

SHUTTERED 30 JULY 22 hr 21 min 42.499 sec (GMT)

ENCOUNTER MINUS 6 hr 57 min 24.367 sec

S/C ALTITUDE 179,478 km, LONG. OF SUB-S/C POINT 24.55 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 4.9 km



MARINER 6 NEAR-ENCOUNTER CONIC PROJECTIONS

KEY: E sub-earth point
 S sub-spacecraft point
 Z sub-solar point
 P Phobos
 D Deimos
 * terminator

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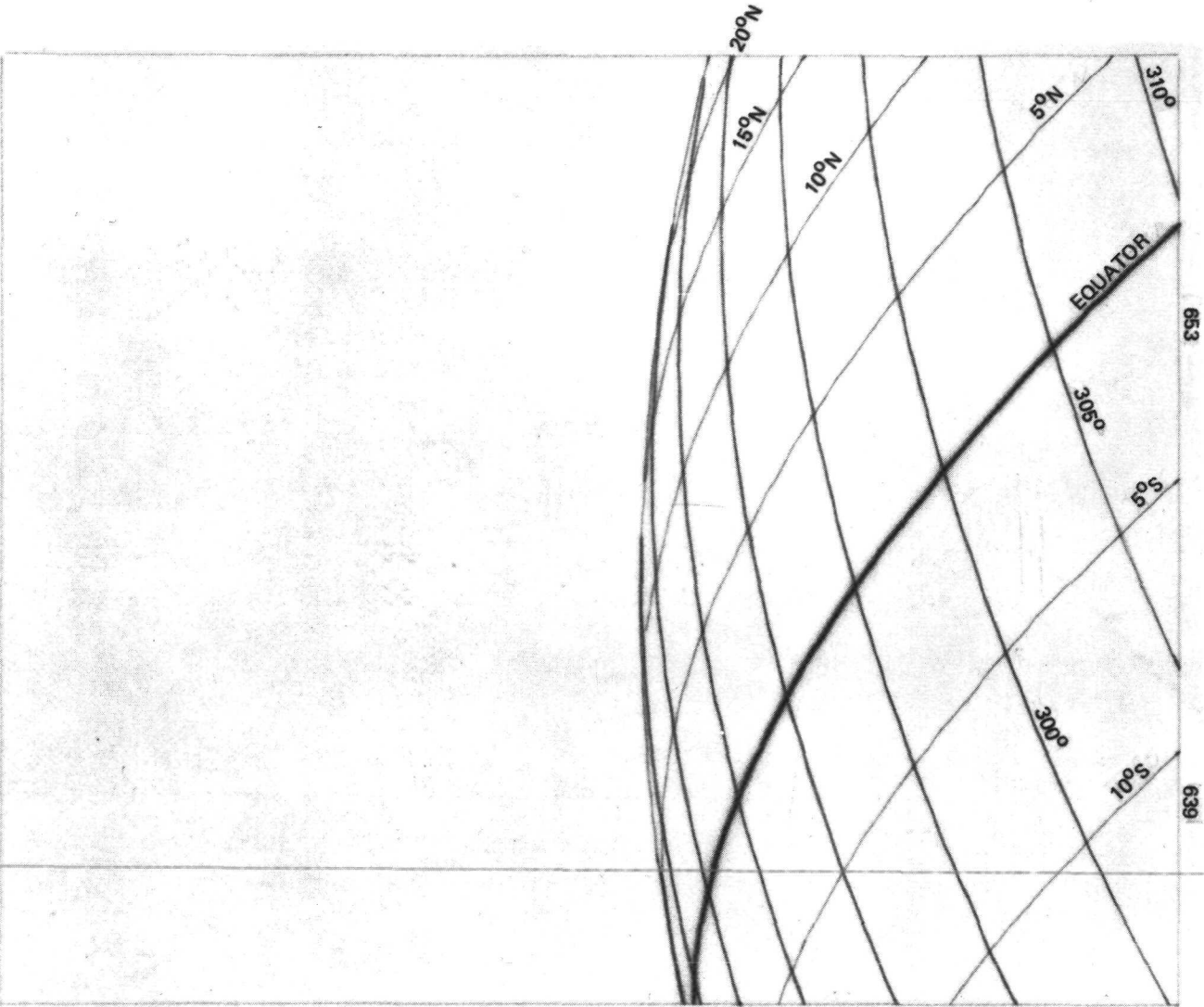
6 NE 1

SHUTTERED E- 13 min 59.2 sec

CONE ANGLE = 128.26 deg, CLOCK ANGLE = 261.77 deg, TWIST ANGLE = -0.23 deg

LAT OF CENTER = deg, LONG OF CENTER = deg, GRID SPACING = 5 deg

SLANT RANGE = km, EM ANGLE = deg, IN ANGLE = deg



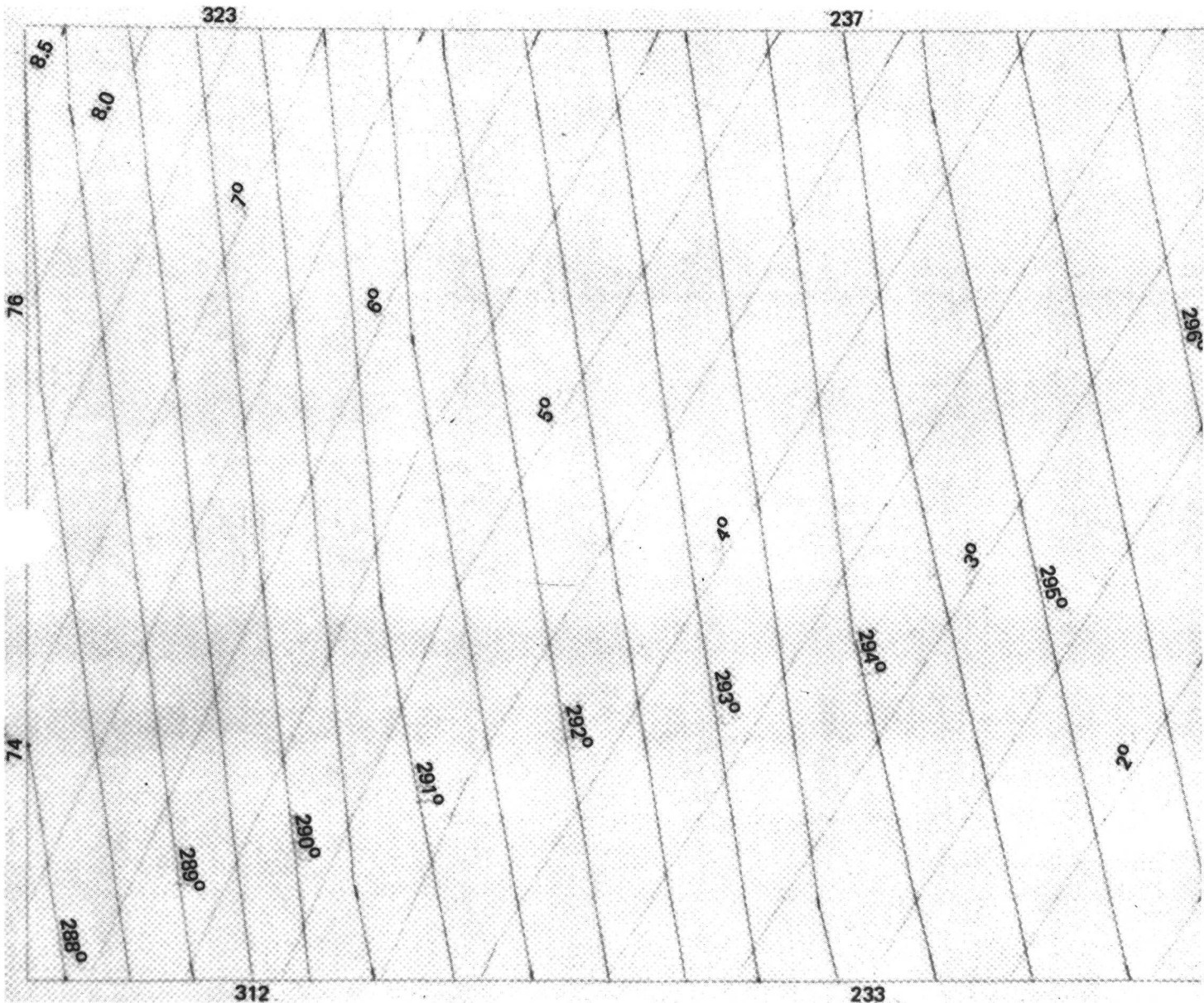
6 NE 2

SHUTTERED E- 13 min 17.0 sec

CONE ANGLE = 128.43 deg, CLOCK ANGLE = 261.77 deg, TWIST ANGLE = -0.46 deg

LAT OF CENTER = 4.5 deg, LONG OF CENTER = 292.7 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 7388.8 km, EM ANGLE = 70.0 deg, IN ANGLE = 18.7 deg



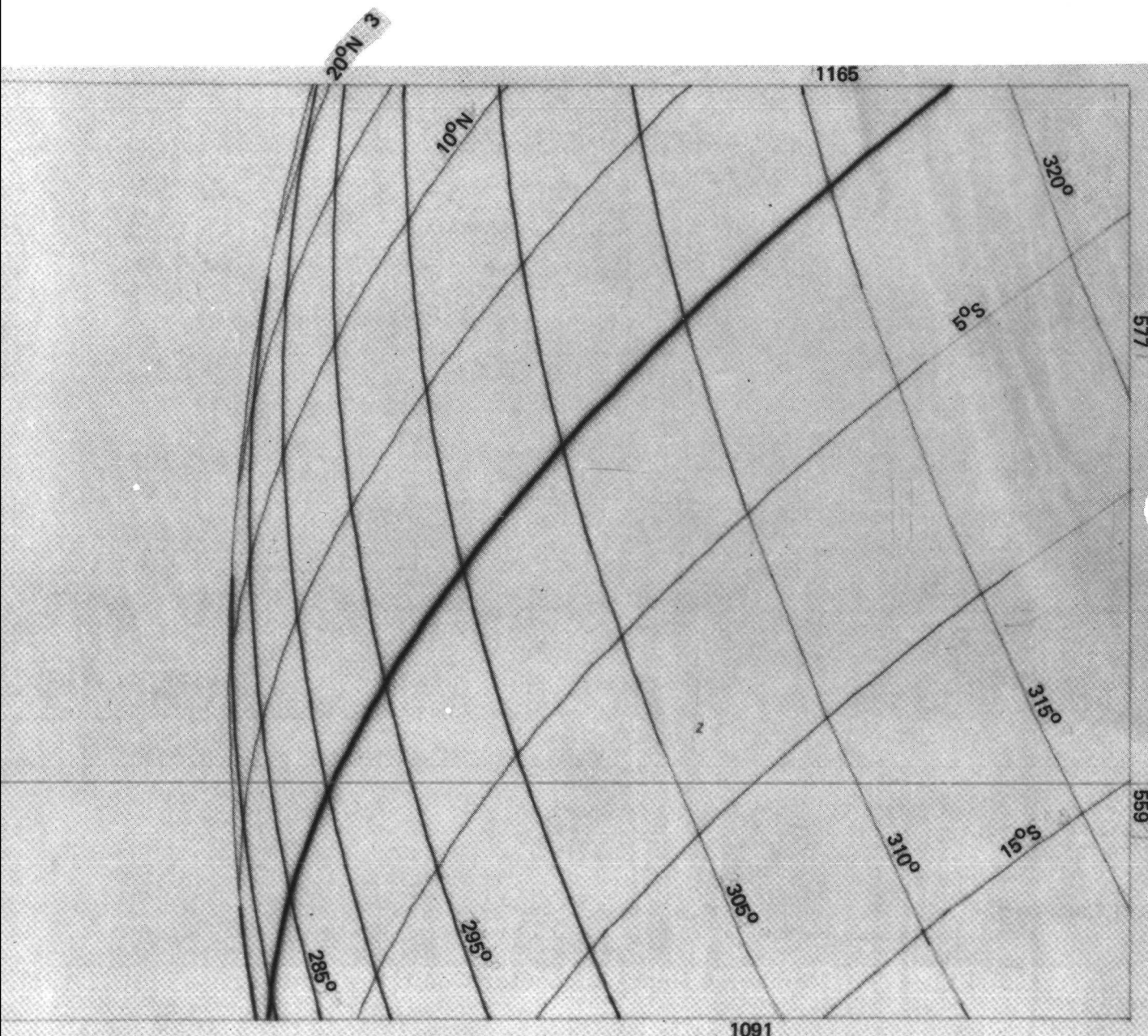
6 NE 3

SHUTTERED E- 12 min 34.8 sec

CONE ANGLE = 128.48 deg, CLOCK ANGLE = 261.76 deg, TWIST ANGLE = -0.37 deg

LAT OF CENTER = -2.0 deg, LONG OF CENTER = 304.0 deg, GRID SPACING = 5 deg

SLANT RANGE = 6598.5 km, EM ANGLE = 57.0 deg, IN ANGLE = 6.7 deg



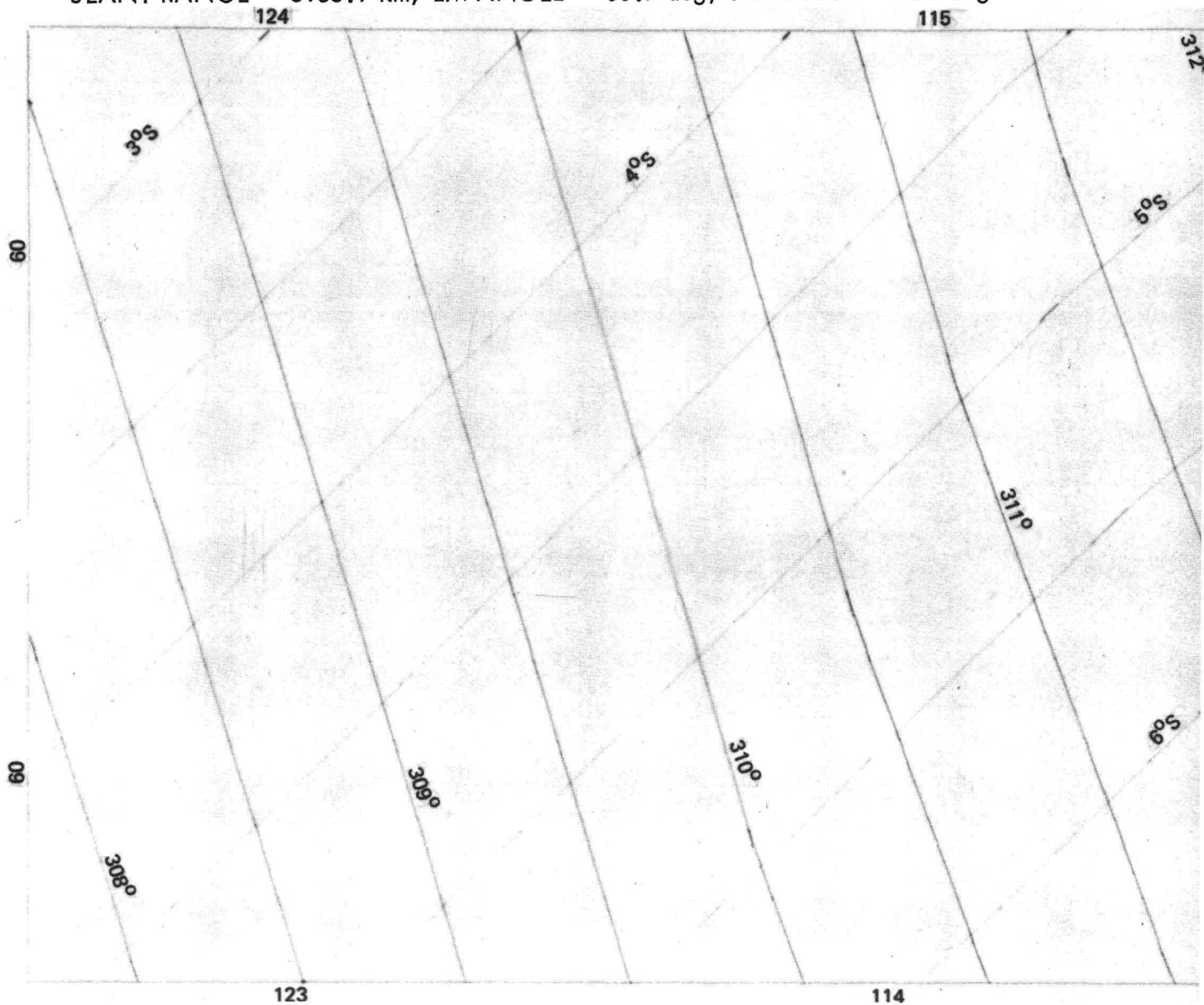
6 NE 4

SHUTTERED E- 11 min 52.5 sec

CONE ANGLE = 128.18 deg, CLOCK ANGLE = 261.75 deg, TWIST ANGLE = -0.26 deg

LAT OF CENTER = -4.6 deg, LONG OF CENTER = 309.9 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 6158.9 km, EM ANGLE = 50.7 deg, IN ANGLE = 5.1 deg



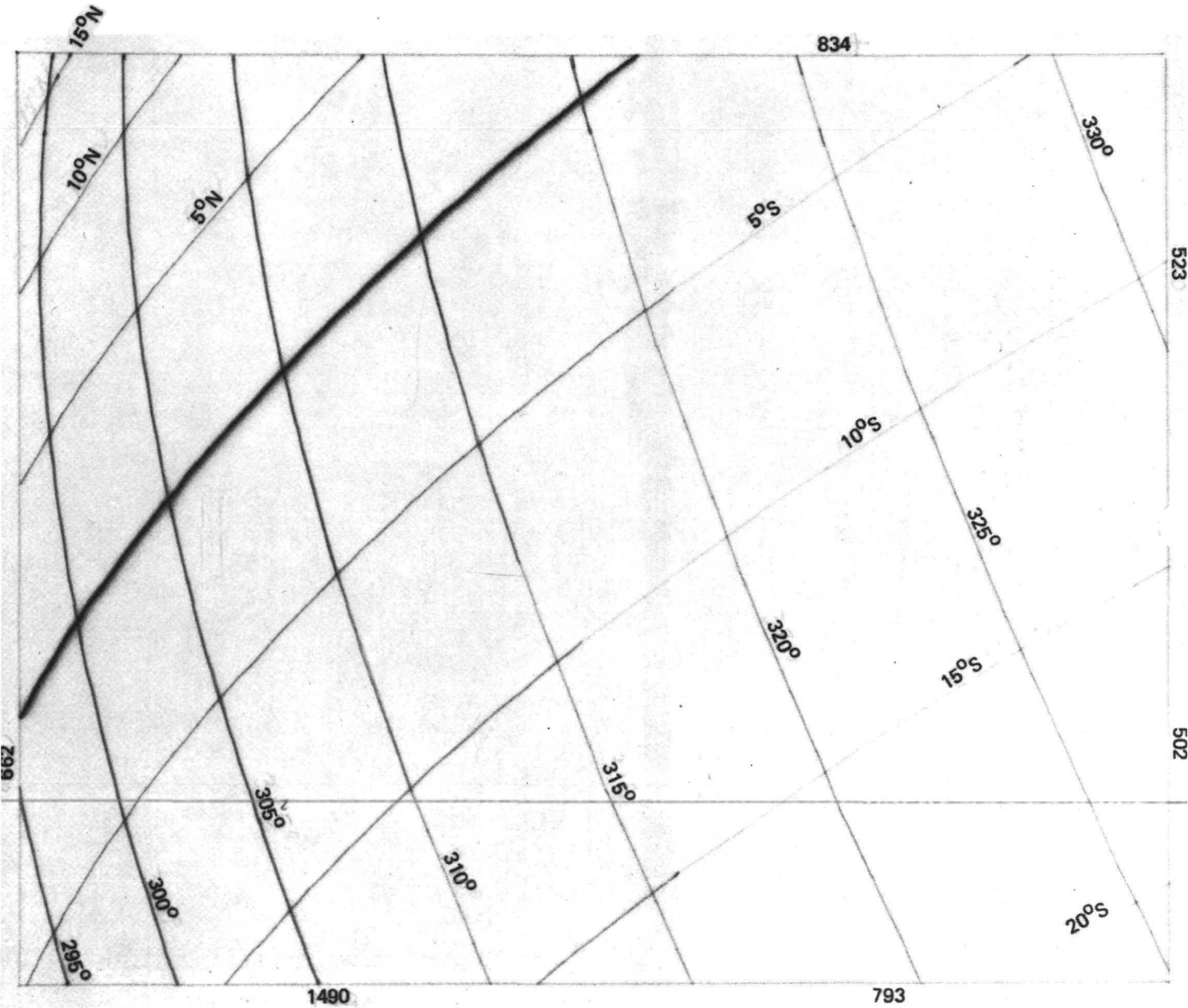
6 NE 5

SHUTTERED E- 11 min 10.2 sec

CONE ANGLE = 128.22 deg, CLOCK ANGLE = 261.64 deg, TWIST ANGLE = -0.45 deg

LAT OF CENTER = -8.1 deg, LONG OF CENTER = 317.2 deg, GRID SPACING = 5 deg

SLANT RANGE = 5699.3 km, EM ANGLE = 42.5 deg, IN ANGLE = 11.1 deg



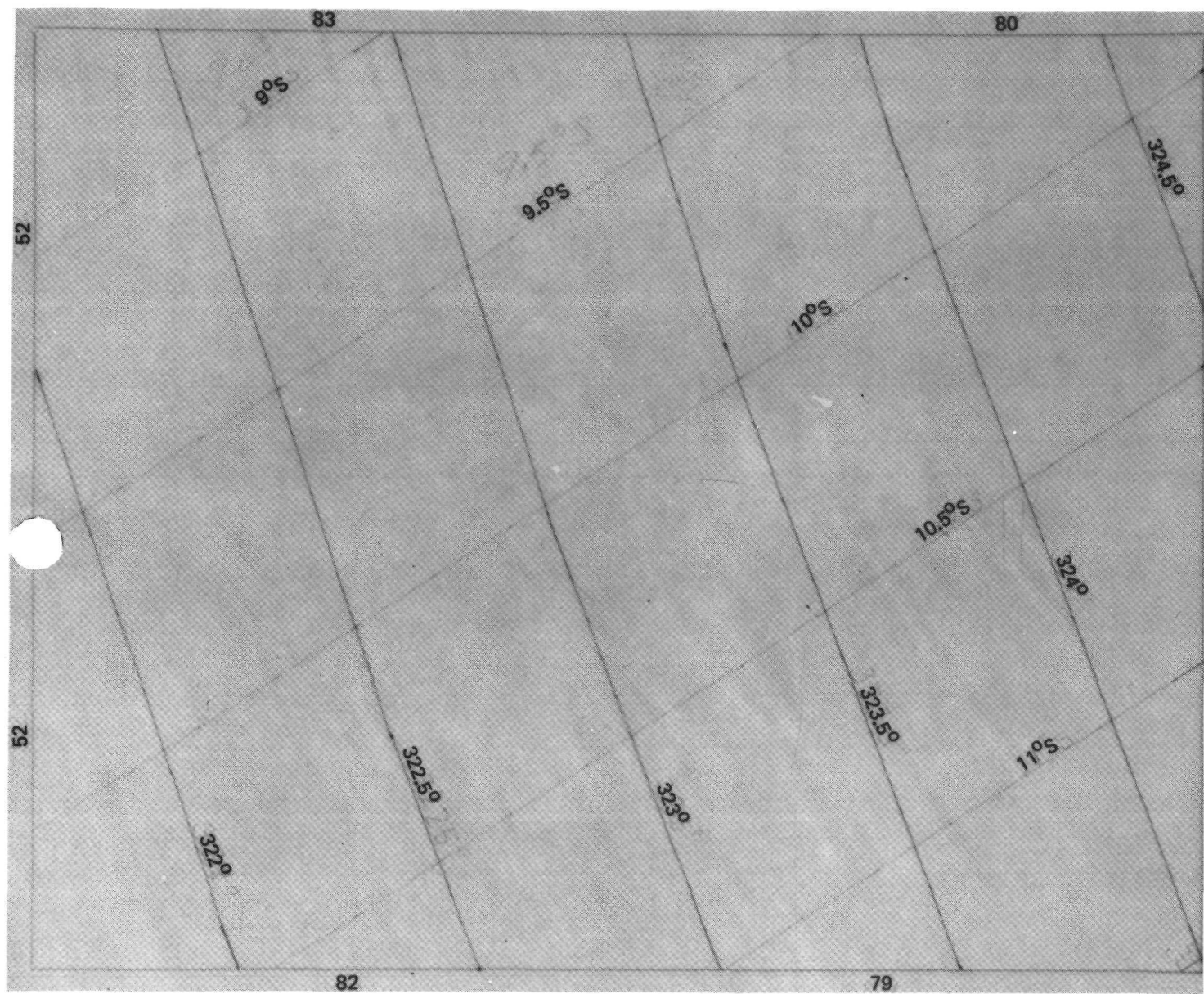
6 NE 6

SHUTTERED E- 10 min 28.0 sec

CONE ANGLE = 128.33 deg, CLOCK ANGLE = 261.61 deg, TWIST ANGLE = -0.61 deg

LAT OF CENTER = -10.1 deg, LONG OF CENTER = 323.2 deg, GRID SPACING = 0.5 deg

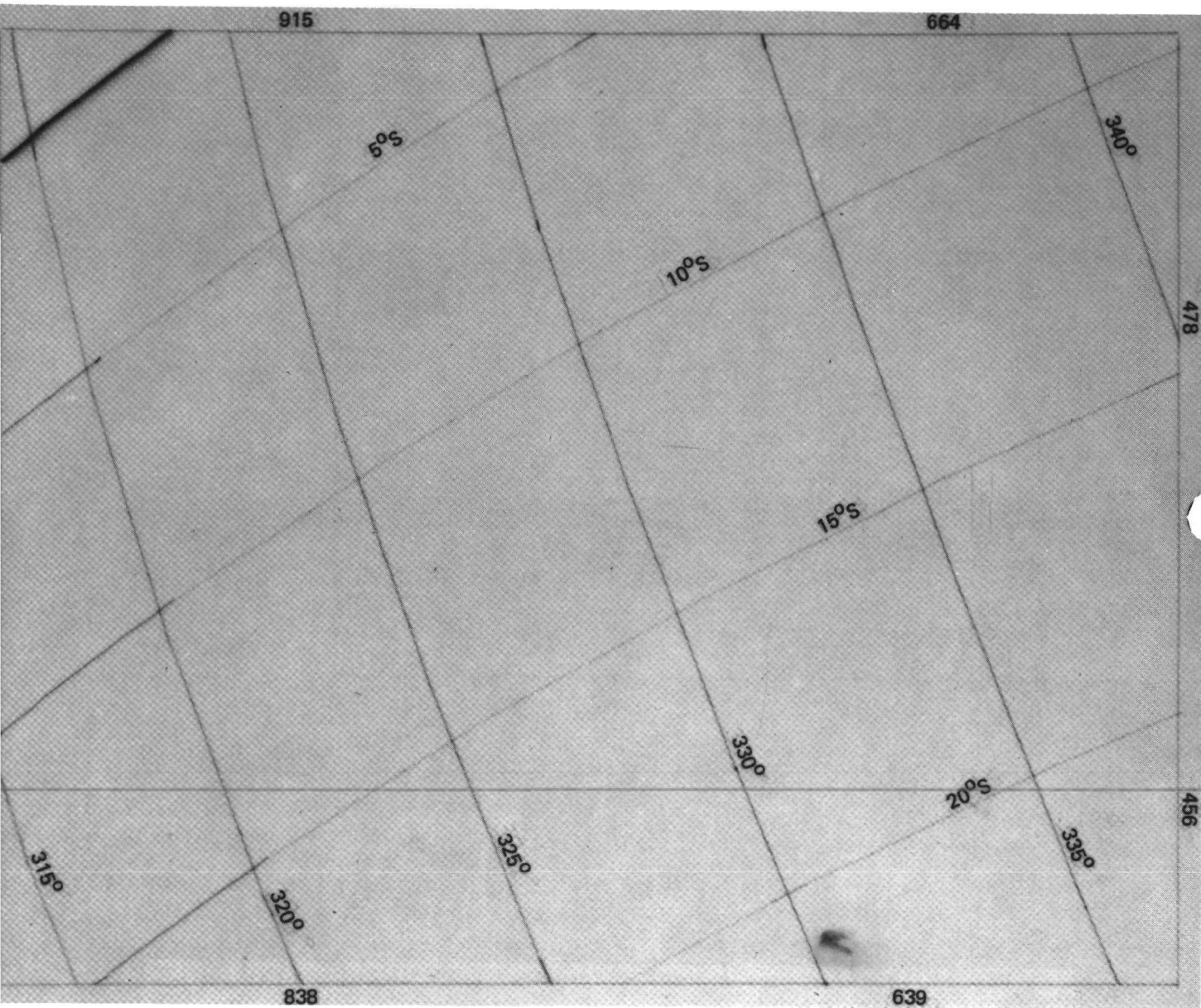
SLANT RANGE = 5355.0 km, EM ANGLE = 36.6 deg, IN ANGLE = 17.2 deg



6 NE 7

SHUTTERED E- 9 min 45.8 sec

CONE ANGLE 128.36 deg, CLOCK ANGLE = 261.81 deg, TWIST ANGLE = -0.38 deg
LAT OF CENTER = -12.7 deg, LONG OF CENTER = 329.2 deg, GRID SPACING = 5 deg
SLANT RANGE = 5030.5 km, EM ANGLE = 30.0 deg, IN ANGLE = 23.6 deg



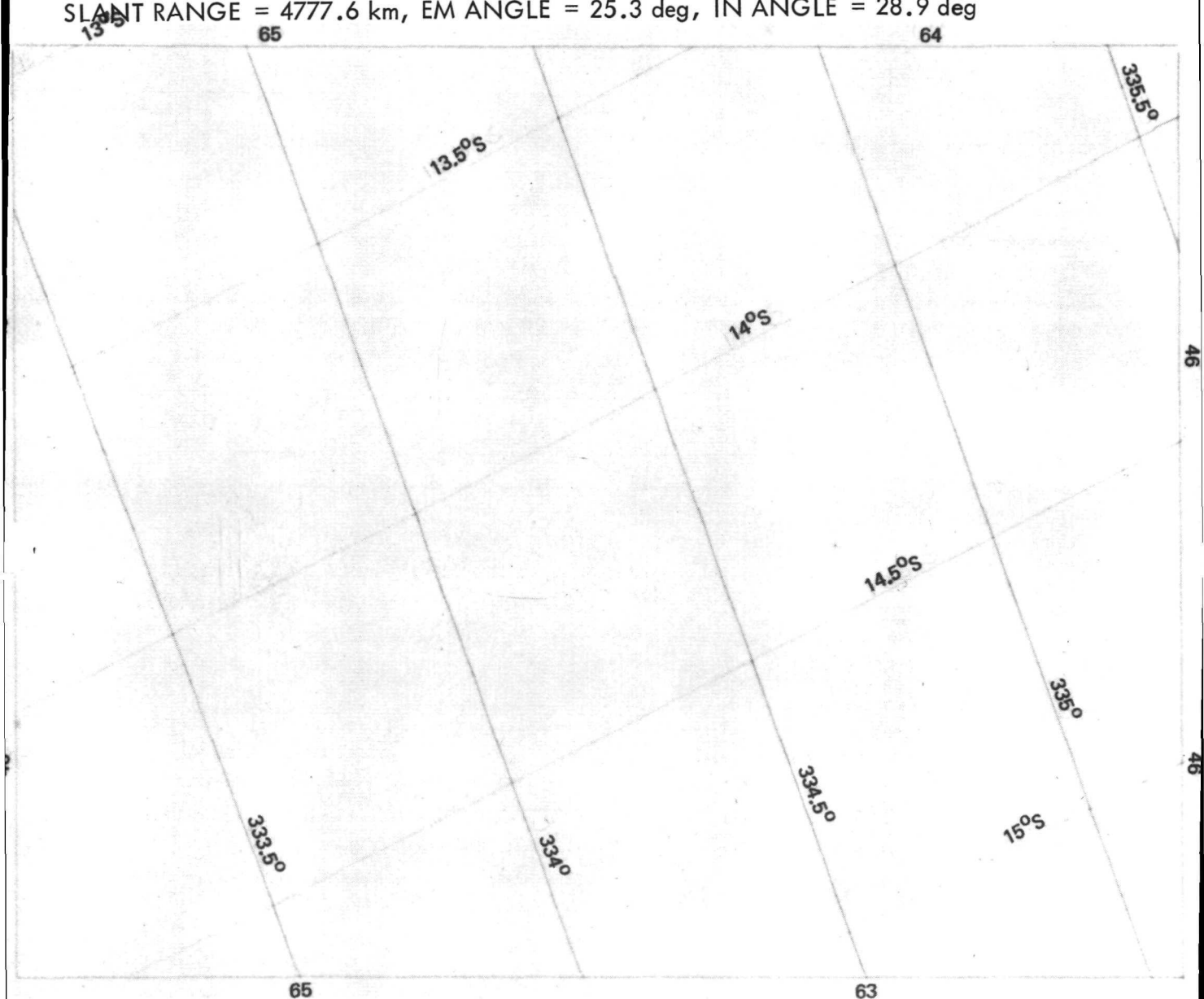
6 NE 8

SHUTTERED E- 9 min 3.6 sec

CONE ANGLE = 128.35 deg, CLOCK ANGLE = 262.02 deg, TWIST ANGLE = -0.07 deg

LAT OF CENTER = -14.2 deg, LONG OF CENTER = 334.3 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 4777.6 km, EM ANGLE = 25.3 deg, IN ANGLE = 28.9 deg



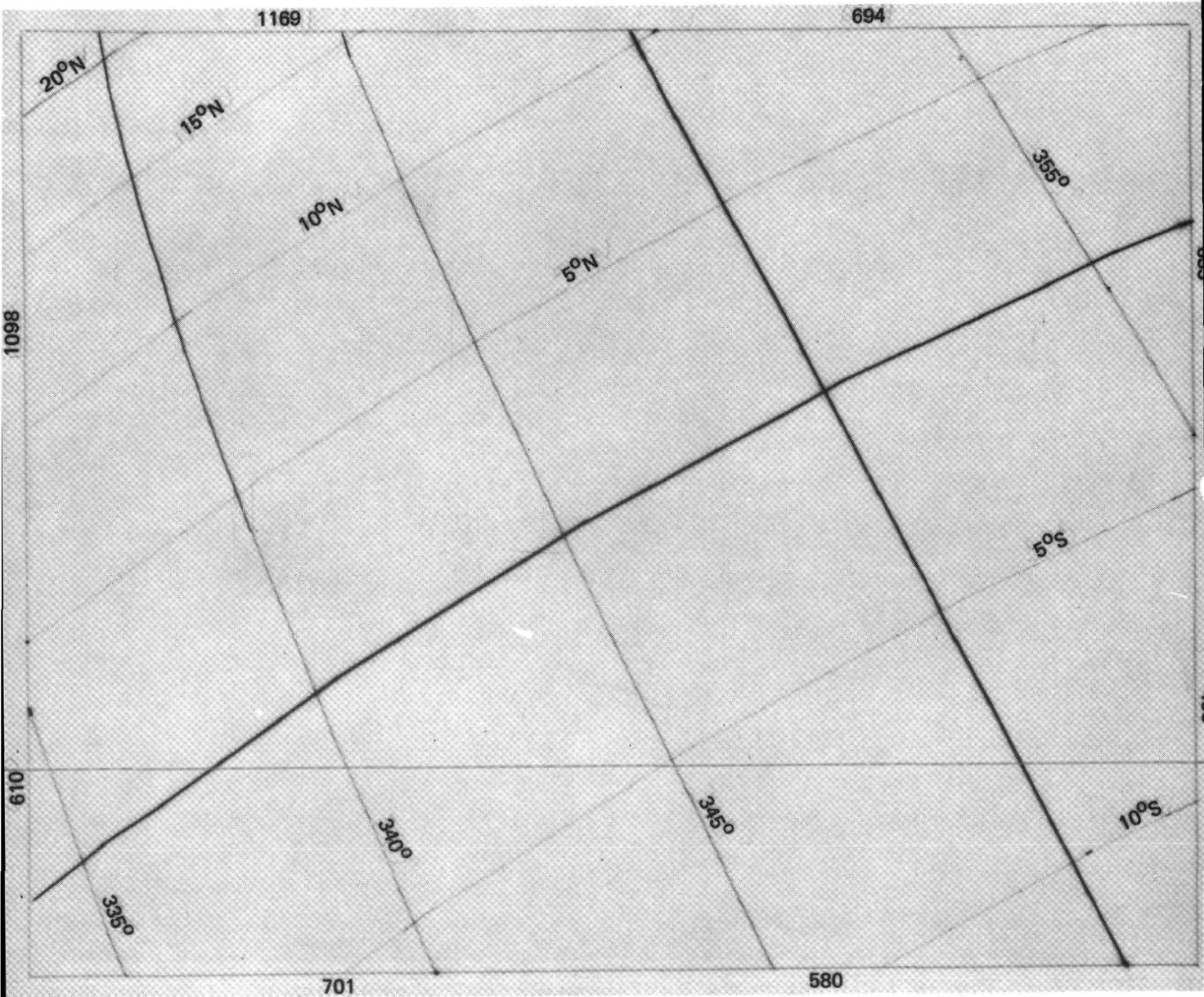
6 NE 9

SHUTTERED E- 8 min 21.3 sec

CONE ANGLE = 128.29 deg, CLOCK ANGLE 247.73 deg, TWIST ANGLE = -0.61 deg

LAT OF CENTER = 0.1 deg, LONG OF CENTER = 346.0 deg, GRID SPACING = 5 deg

SLANT RANGE = 4929.9 km, EM ANGLE = 40.9 deg, IN ANGLE = 41.3 deg



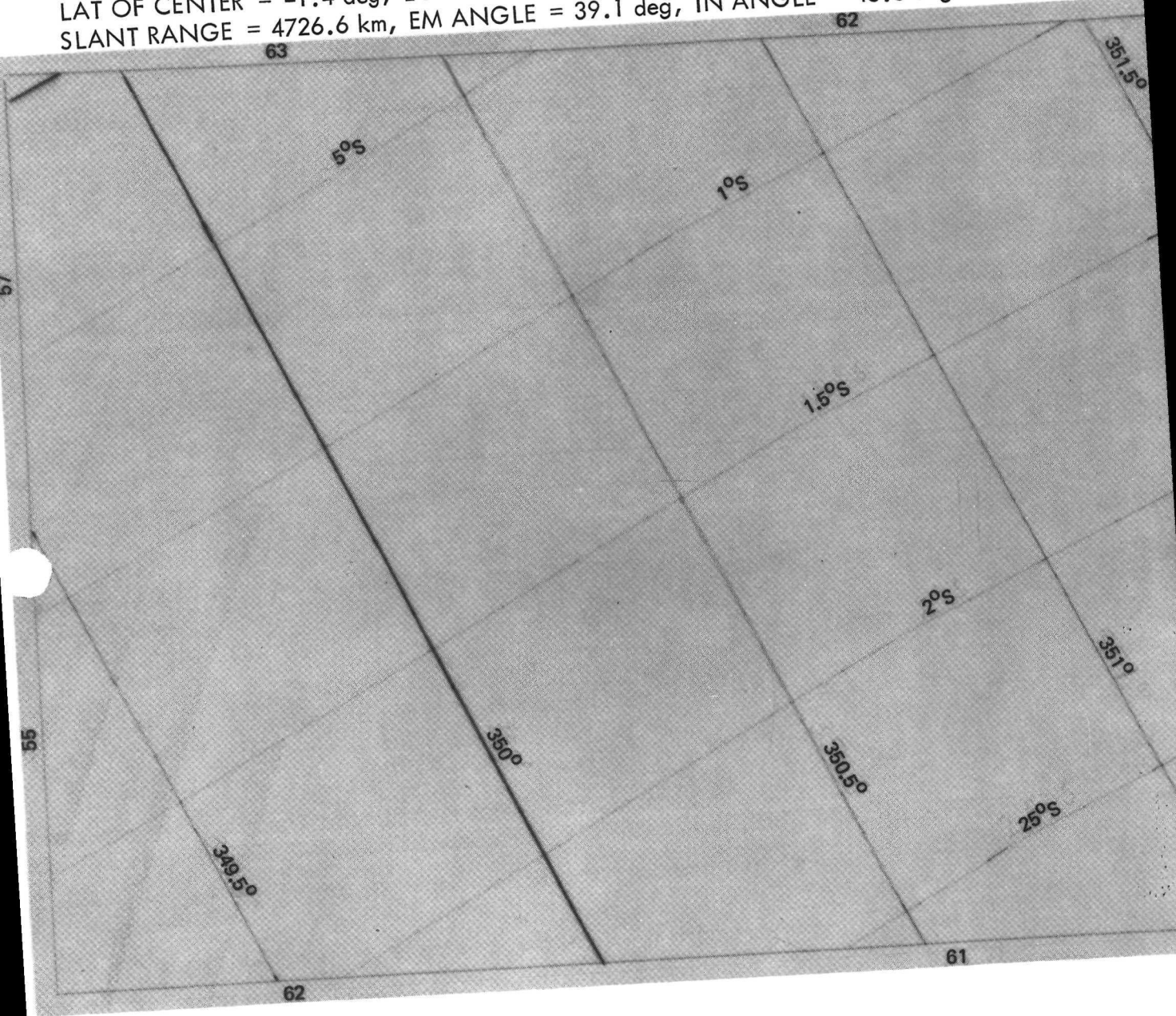
6 NE 10

SHUTTERED E- 7 min 39.1 sec

CONE ANGLE = 128.24 deg, CLOCK ANGLE = 248.15 deg, TWIST ANGLE = -0.09 deg

LAT OF CENTER = -1.4 deg, LONG OF CENTER = 350.4 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 4726.6 km, EM ANGLE = 39.1 deg, IN ANGLE = 45.5 deg



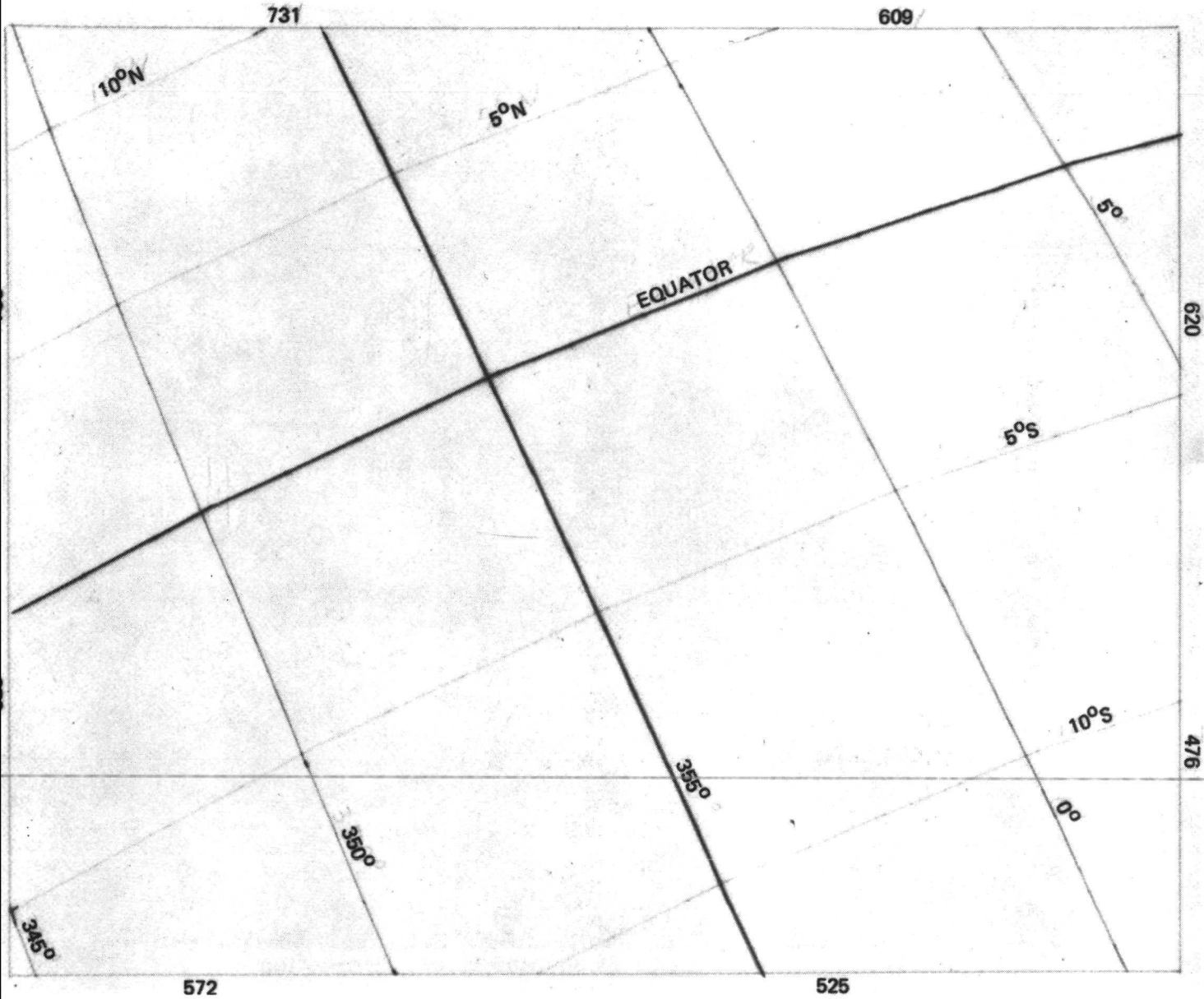
6 NE 11

SHUTTERED E- 6 min 56.8 sec

CONE ANGLE = 128.40 deg, CLOCK ANGLE = 284.22 deg, TWIST ANGLE = -0.10 deg

LAT OF CENTER = -3.1 deg, LONG OF CENTER = 355.7 deg, GRID SPACING = 5 deg

SLANT RANGE = 4540.9 km, EM ANGLE = 37.4 deg, IN ANGLE = 50.6 deg



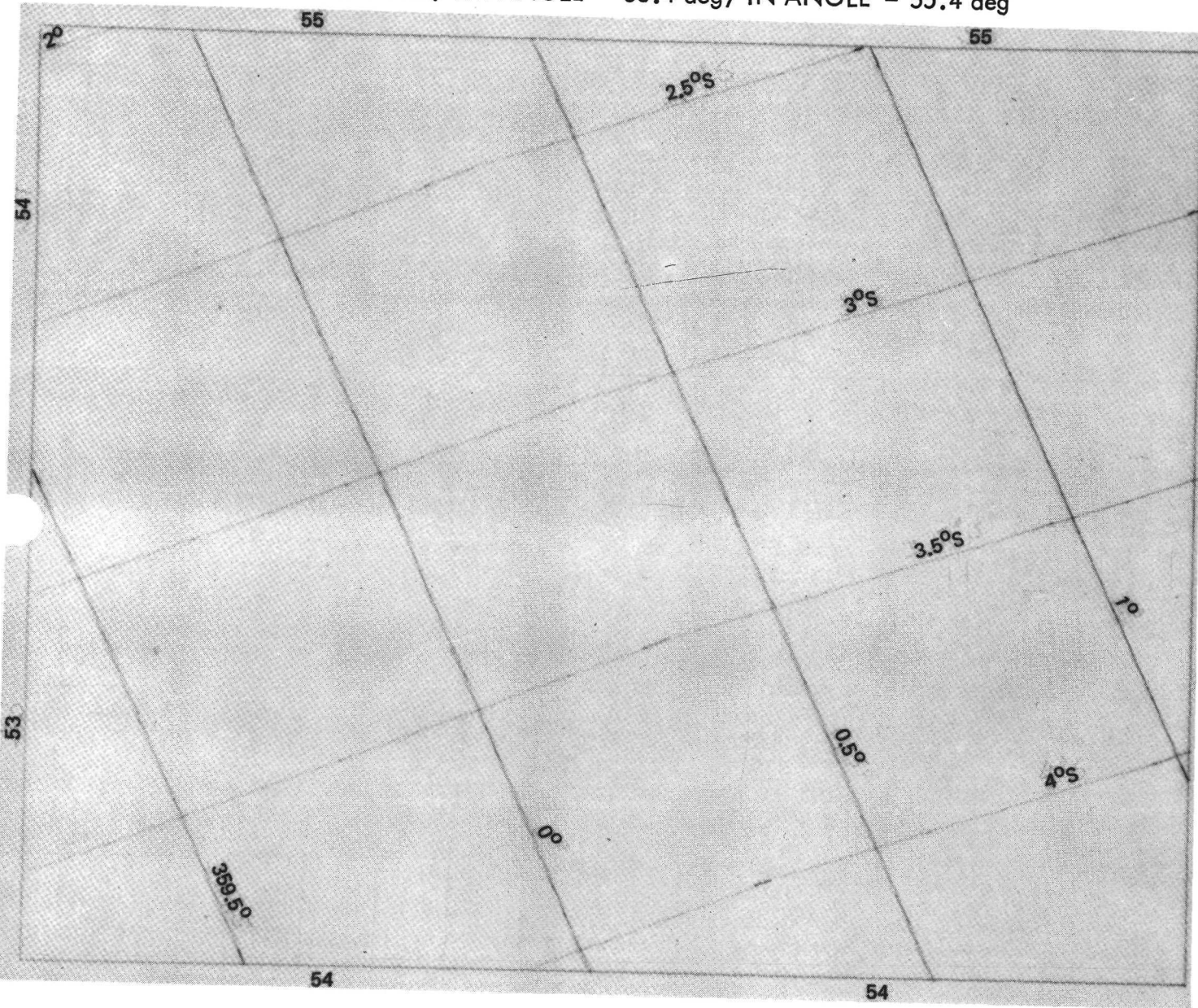
6 NE 12

SHUTTERED E- 6 min 14.6 sec

CONE ANGLE = 128.25 deg, CLOCK ANGLE = 248.09 deg, TWIST ANGLE = -0.30 deg

LAT OF CENTER = -3.2 deg, LONG OF CENTER = 0.3 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 4428.4 km, EM ANGLE = 38.4 deg, IN ANGLE = 55.4 deg



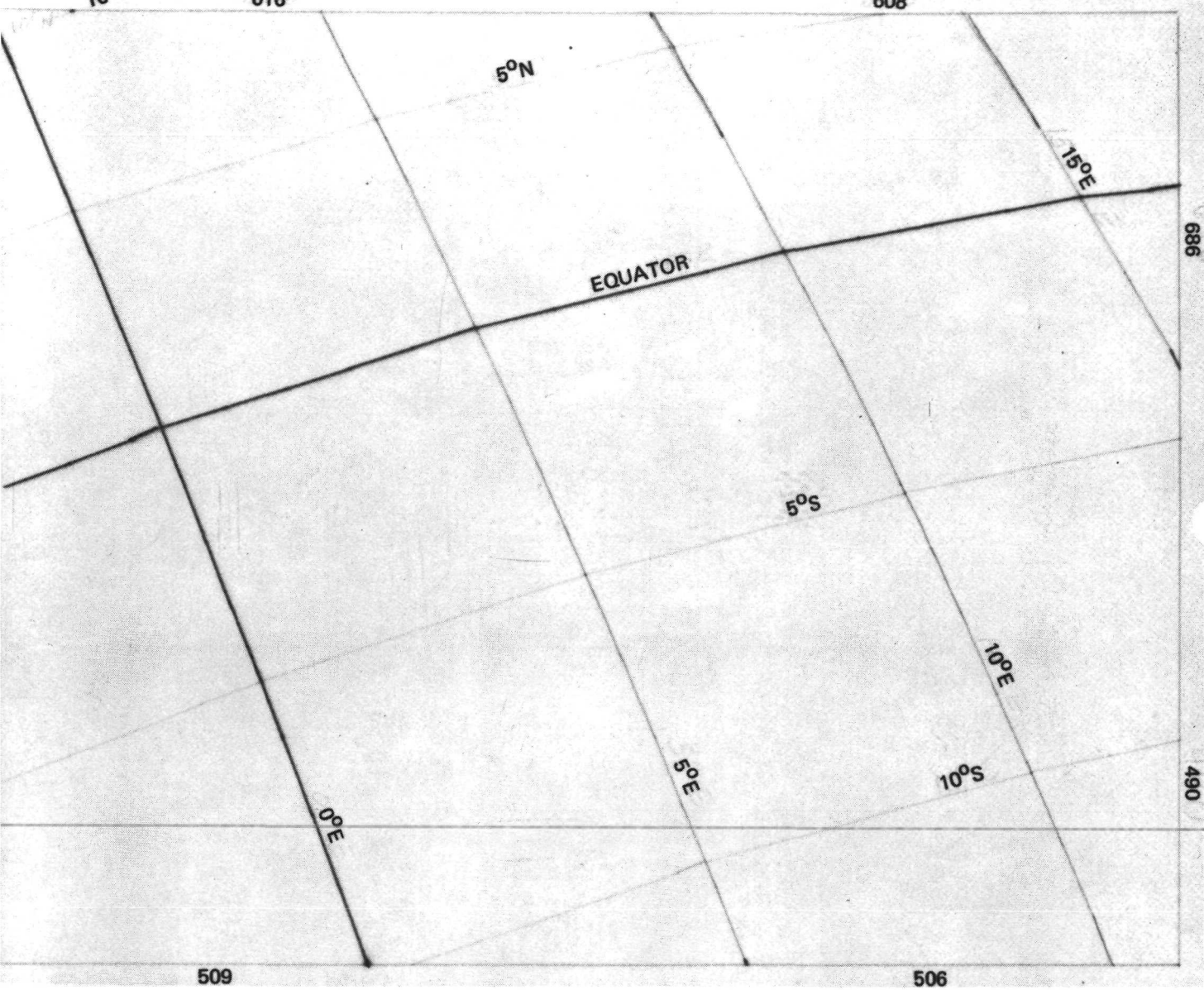
6 NE 13

SHUTTERED E- 5 min 32.3 sec

CONE ANGLE = 128.13 deg, CLOCK ANGLE = 247.88 deg, TWIST ANGLE = -0.49 deg

LAT OF CENTER = -3.6 deg, LONG OF CENTER = 5.5 deg, GRID SPACING = 5 deg

SLANT RANGE = 4331.3 km, EM ANGLE = 39.5 deg, IN ANGLE = 60.7 deg



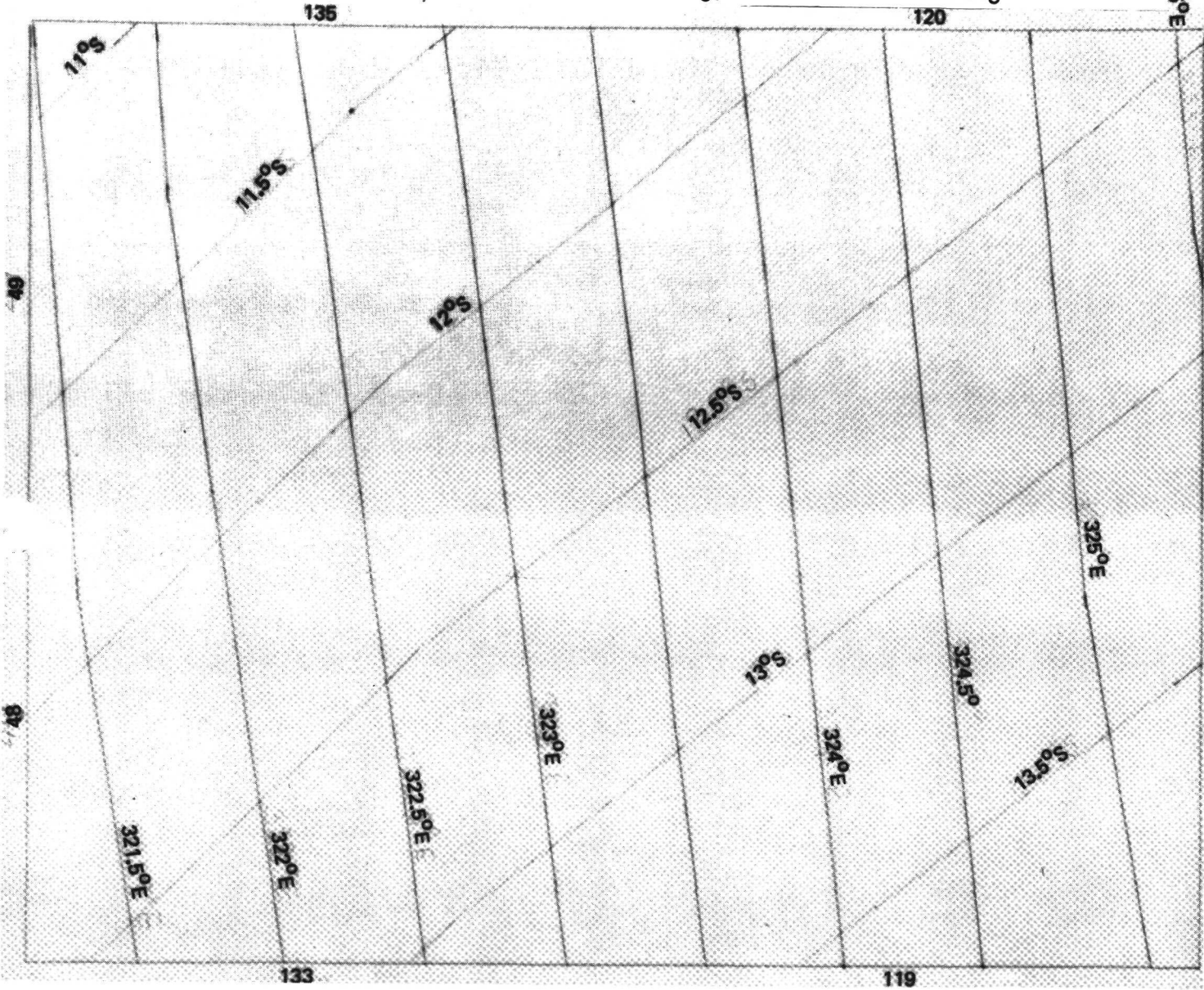
6 NE 14

SHUTTERED E- 4 min 50.1 sec

CONE ANGLE = 99.70 deg, CLOCK ANGLE = 268.05 deg, TWIST ANGLE = -0.24 deg

LAT OF CENTER = -12.5 deg, LONG OF CENTER = 323.5 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 4903.2 km, EM ANGLE = 61.5 deg, IN ANGLE = 19.2 deg



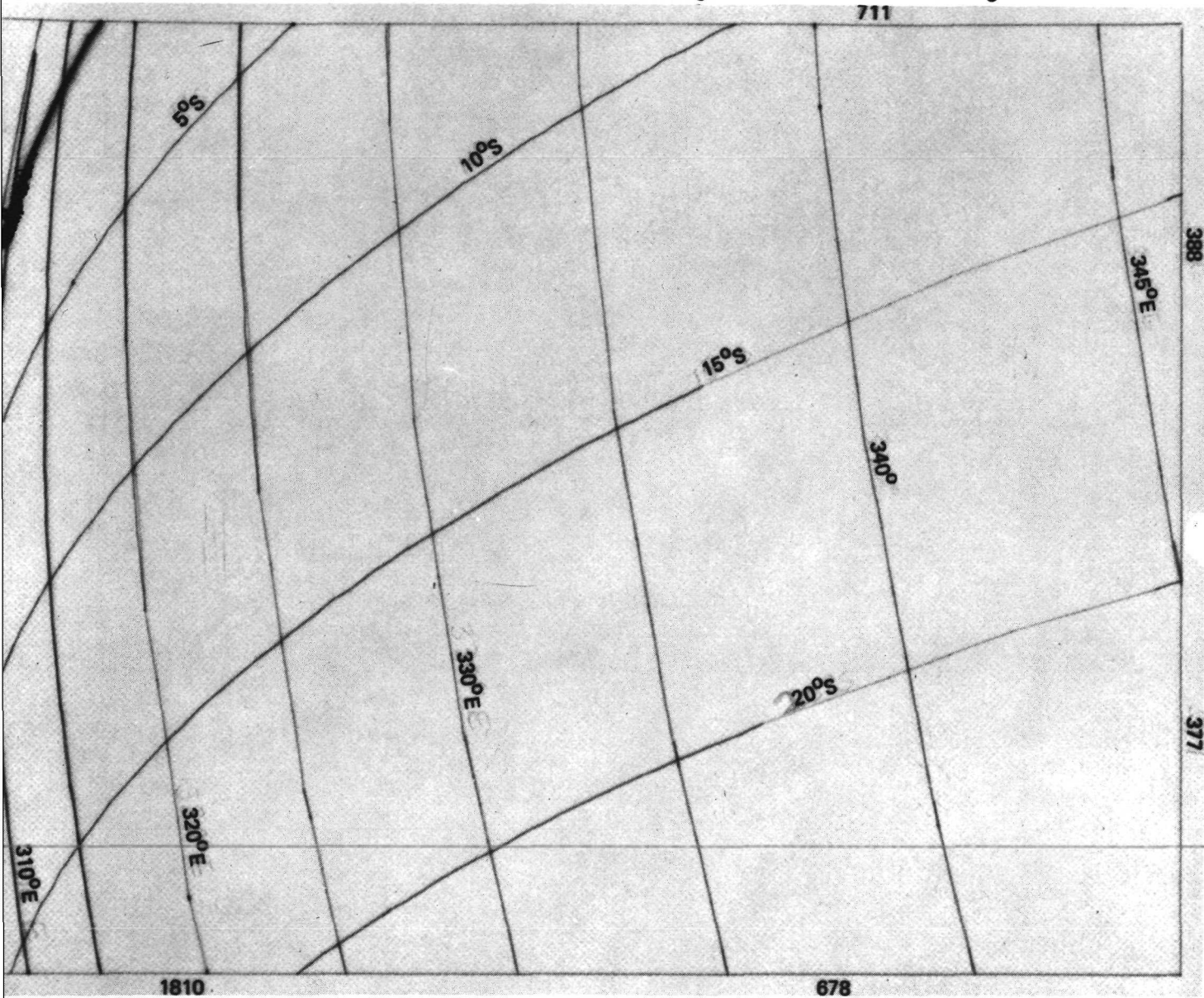
6 NE 15

SHUTTERED E- 4 min 7.8 sec

CONE ANGLE = 99.92 deg, CLOCK ANGLE = 268.06 deg, TWIST ANGLE = -0.24 deg

LAT OF CENTER = -15.8 deg, LONG OF CENTER = 334.2 deg, GRID SPACING = 5 deg

SLANT RANGE = 4404.5 km, EM ANGLE = 50.1 deg, IN ANGLE = 30.2 deg



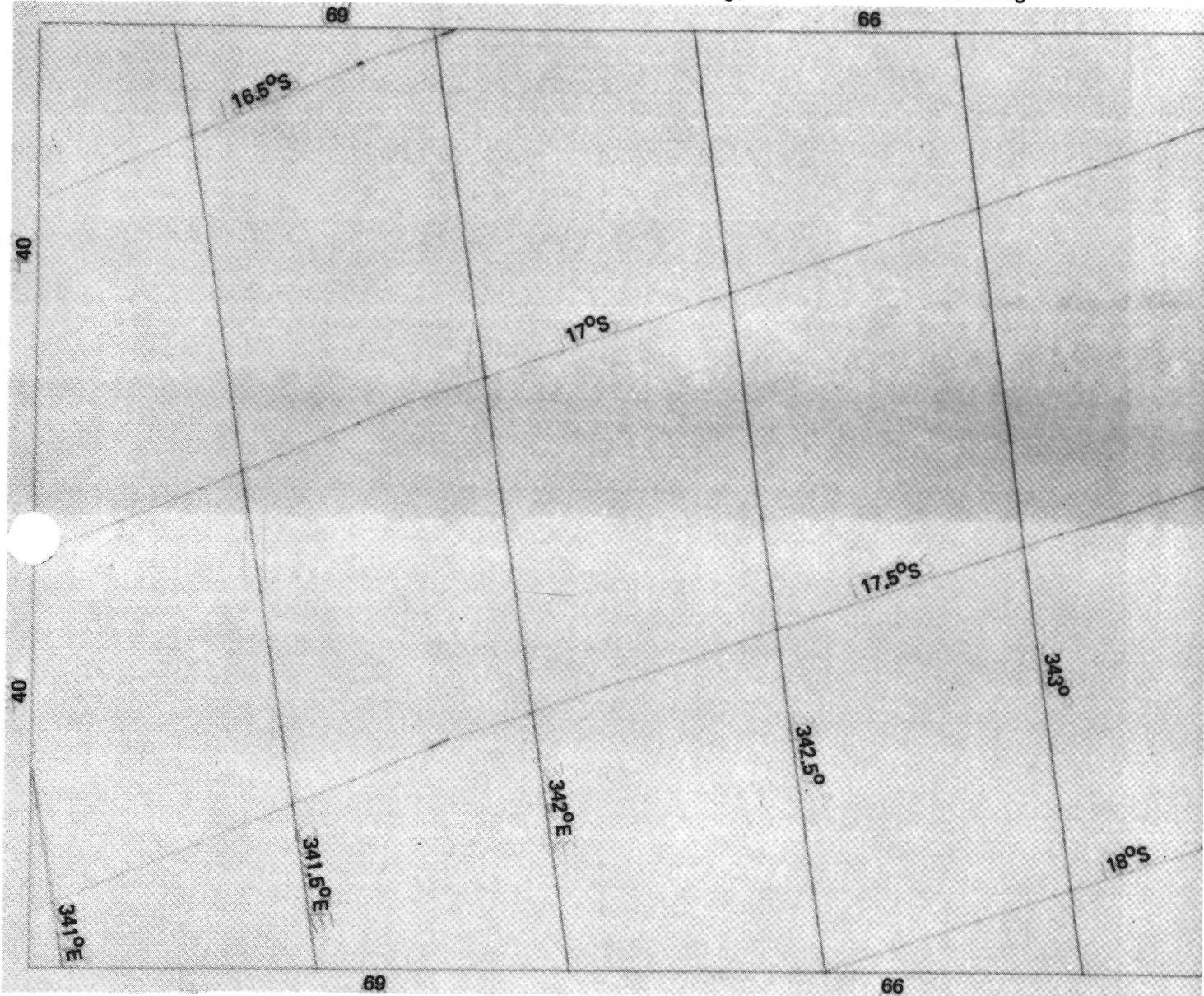
6 NE 16

SHUTTERED E- 3 min 25.6 sec

CONE ANGLE = 100.15 deg, CLOCK ANGLE = 268.01 deg, TWIST ANGLE = -0.24 deg

LAT OF CENTER = -17.3 deg, LONG OF CENTER = 342.3 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 4104.8 km, EM ANGLE = 42.2 deg, IN ANGLE = 38.2 deg



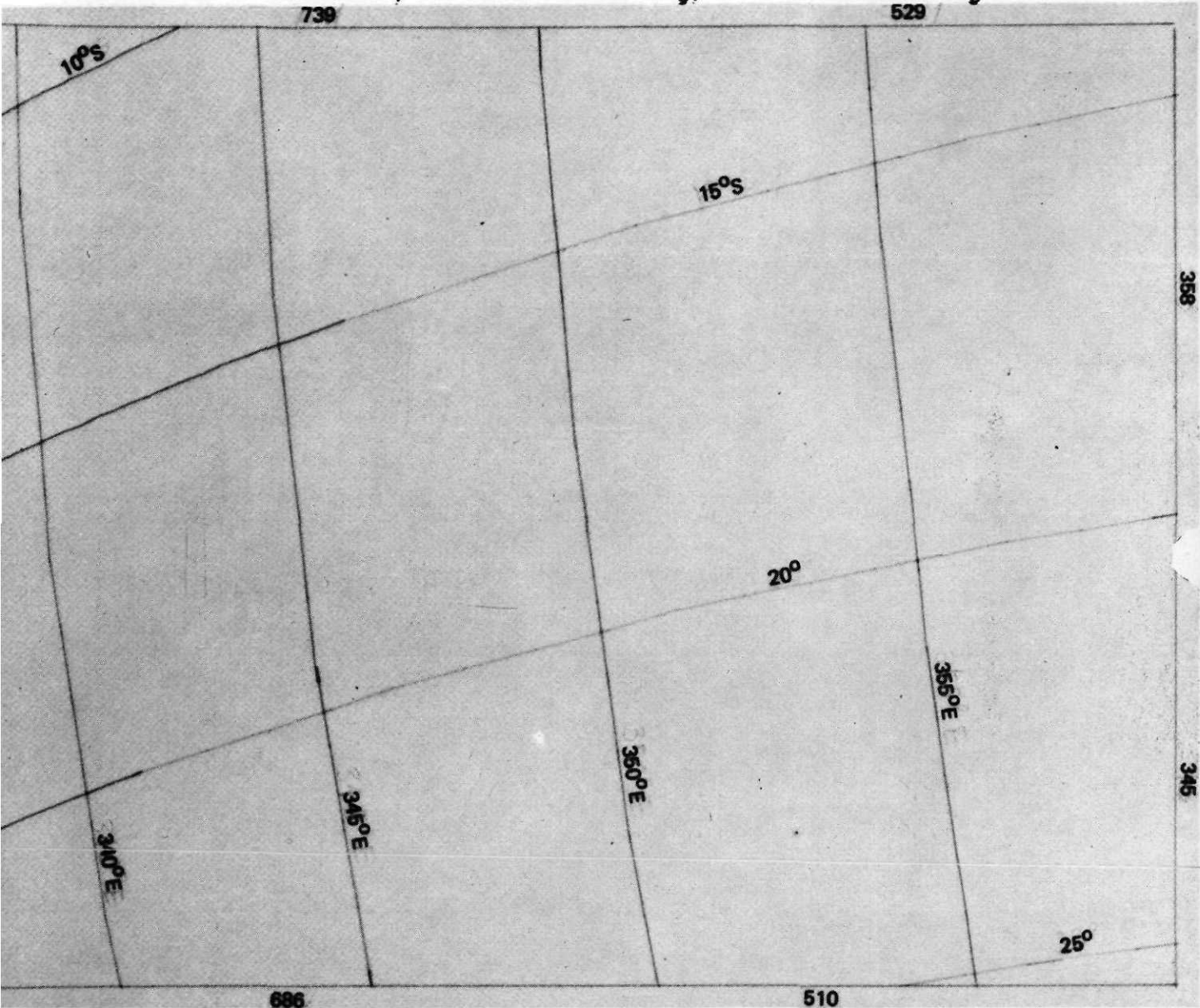
6 NE 17

SHUTTERED E- 2 min 43.4 sec

CONE ANGLE = 100.25 deg, CLOCK ANGLE = 267.93 deg, TWIST ANGLE = -0.31 deg

LAT OF CENTER = -18.4 deg, LONG OF CENTER = 350.0 deg, GRID SPACING = 5 deg

SLANT RANGE = 3865.1 km, EM ANGLE = 34.4 deg, IN ANGLE = 45.8 deg



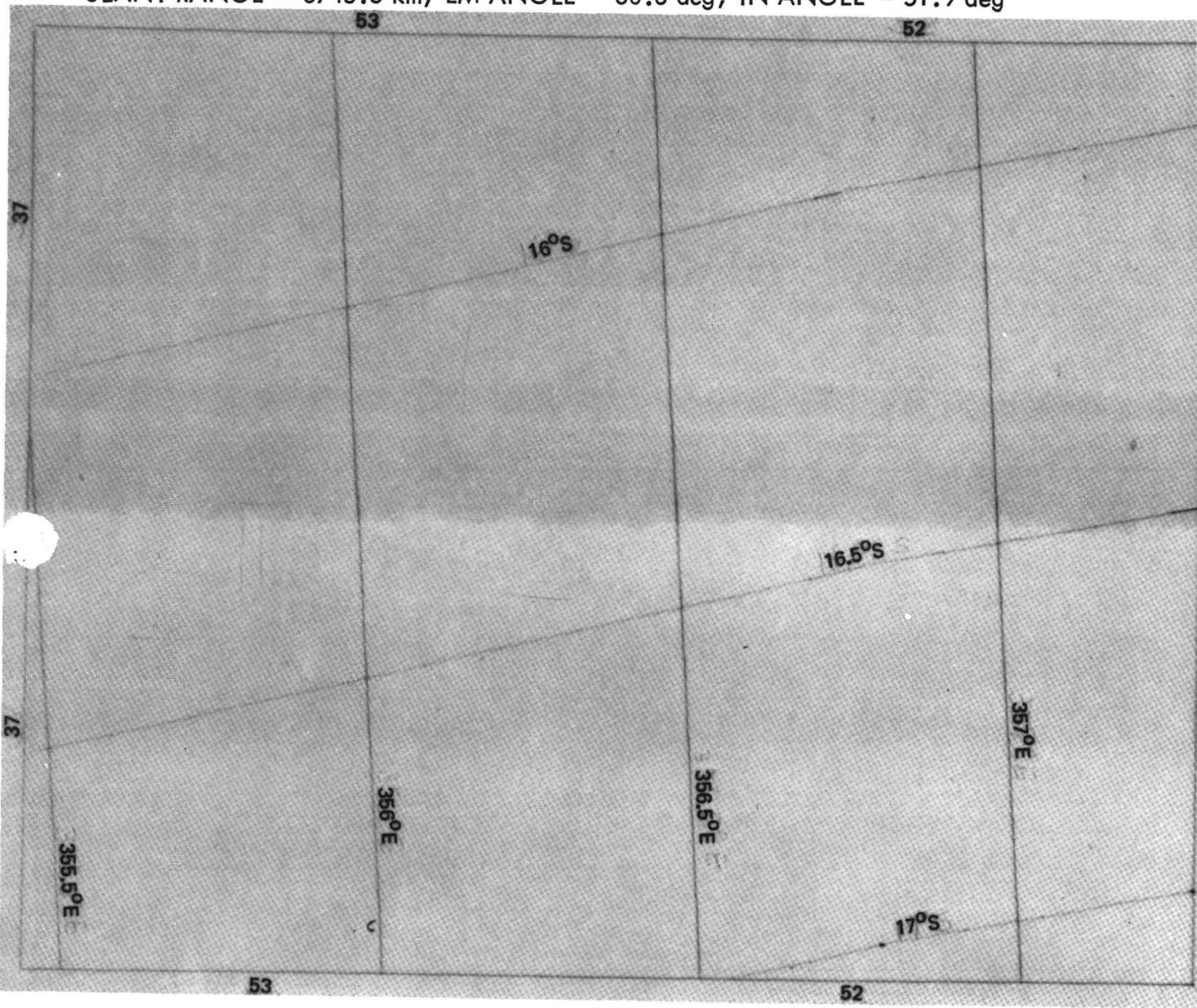
6 NE 18

SHUTTERED E- 2 min 1.2 sec

CONE ANGLE = 100.04 deg, CLOCK ANGLE = 265.83 deg, TWIST ANGLE = -0.48 deg

LAT OF CENTER = -16.4 deg, LONG OF CENTER = 356.4 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 3745.5 km, EM ANGLE = 30.8 deg, IN ANGLE = 51.9 deg



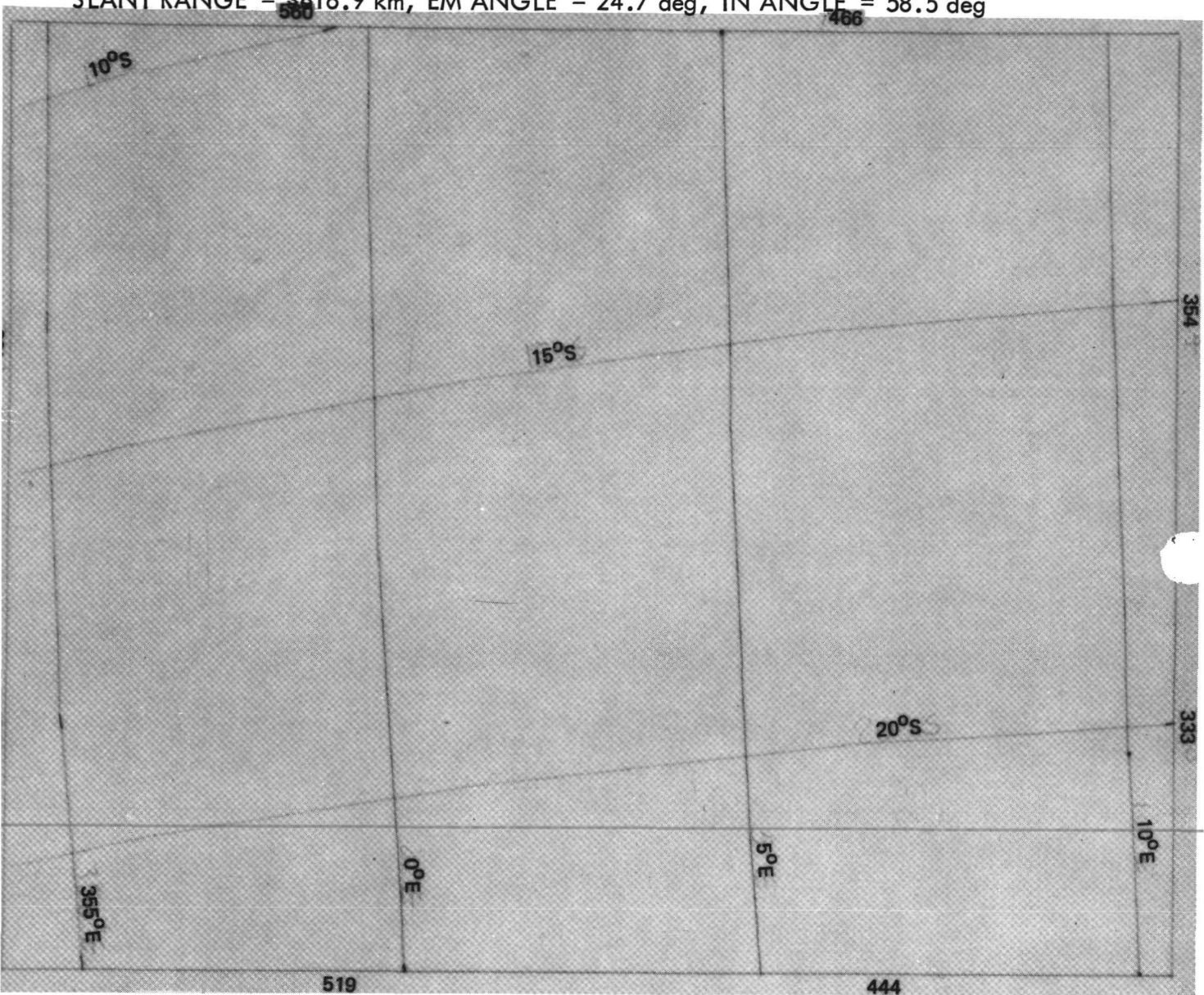
6 NE 19

SHUTTERED E- 1 min 18.9 sec

CONE ANGLE = 100.08 deg, CLOCK ANGLE = 265.85 deg, TWIST ANGLE = -0.46 deg

LAT OF CENTER = -16.8 deg, LONG OF CENTER = 3.1 deg, GRID SPACING = 5 deg

SLANT RANGE = 3616.9 km, EM ANGLE = 24.7 deg, IN ANGLE = 58.5 deg



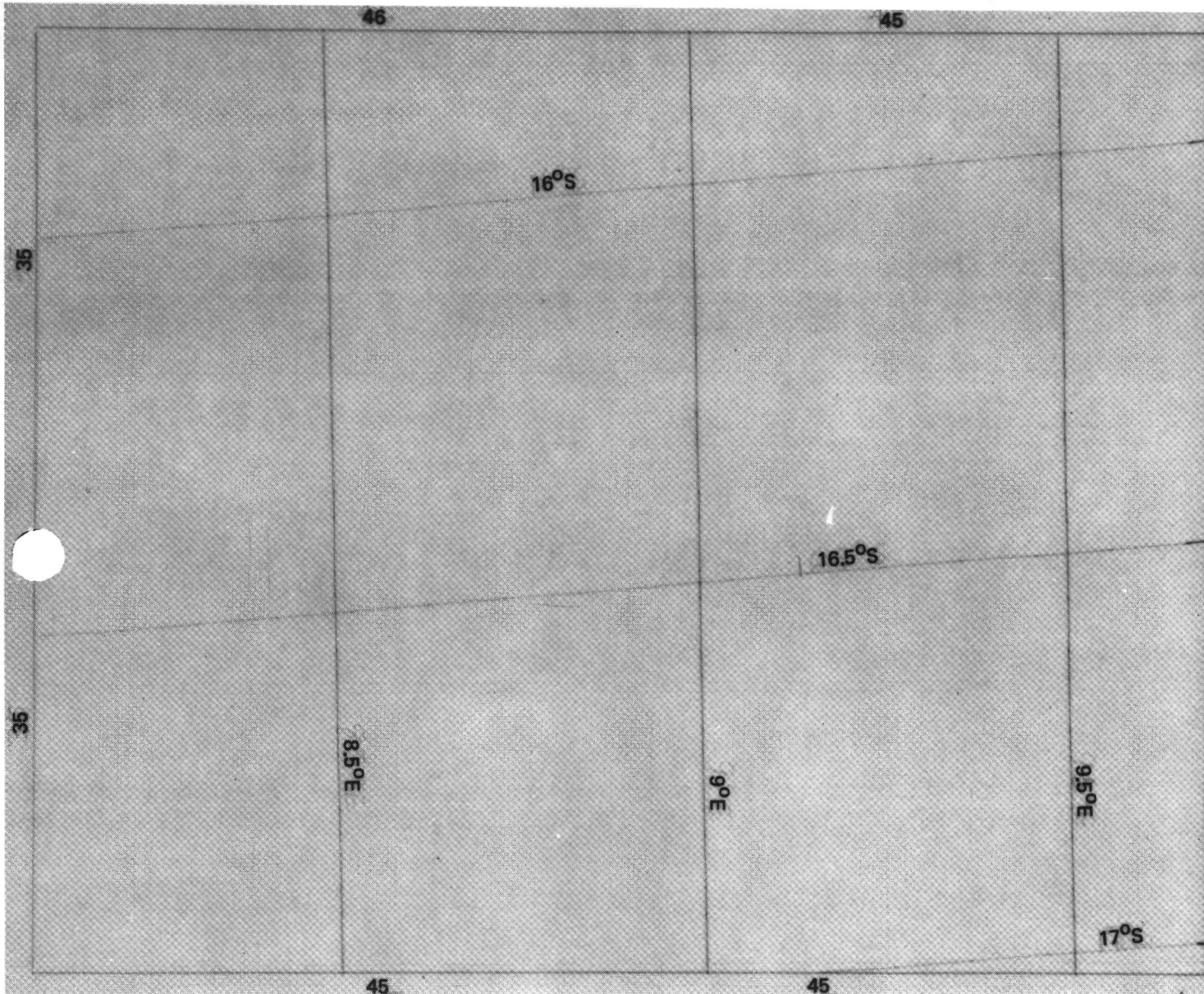
6 NE 20

SHUTTERED E- 0 min 36.7 sec

CONE ANGLE = 100.11 deg, CLOCK ANGLE = 265.86 deg, TWIST ANGLE = -0.43 deg

LAT OF CENTER = -16.4 deg, LONG OF CENTER = 8.9 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 3546.3 km, EM ANGLE = 20.6 deg, IN ANGLE = 64.2 deg



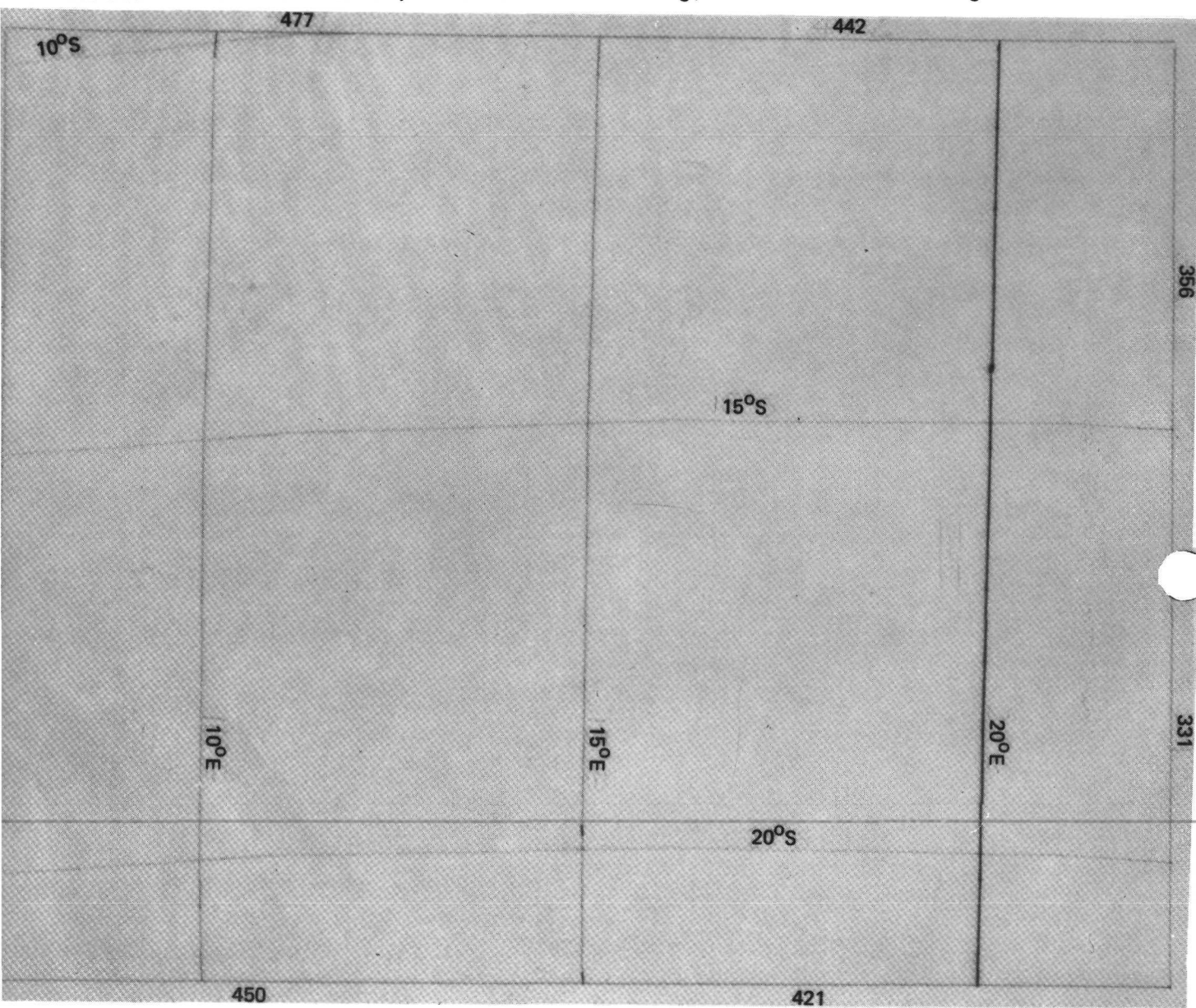
6 NE 21

SHUTTERED E+ 0 min 5.6 sec

CONE ANGLE = 100.08 deg, CLOCK ANGLE = 265.88 deg, TWIST ANGLE = -0.33 deg

LAT OF CENTER = -16.1 deg, LONG OF CENTER = 15.0 deg, GRID SPACING = 5 deg

SLANT RANGE = 3500.7 km, EM ANGLE = 16.6 deg, IN ANGLE = 70.3 deg



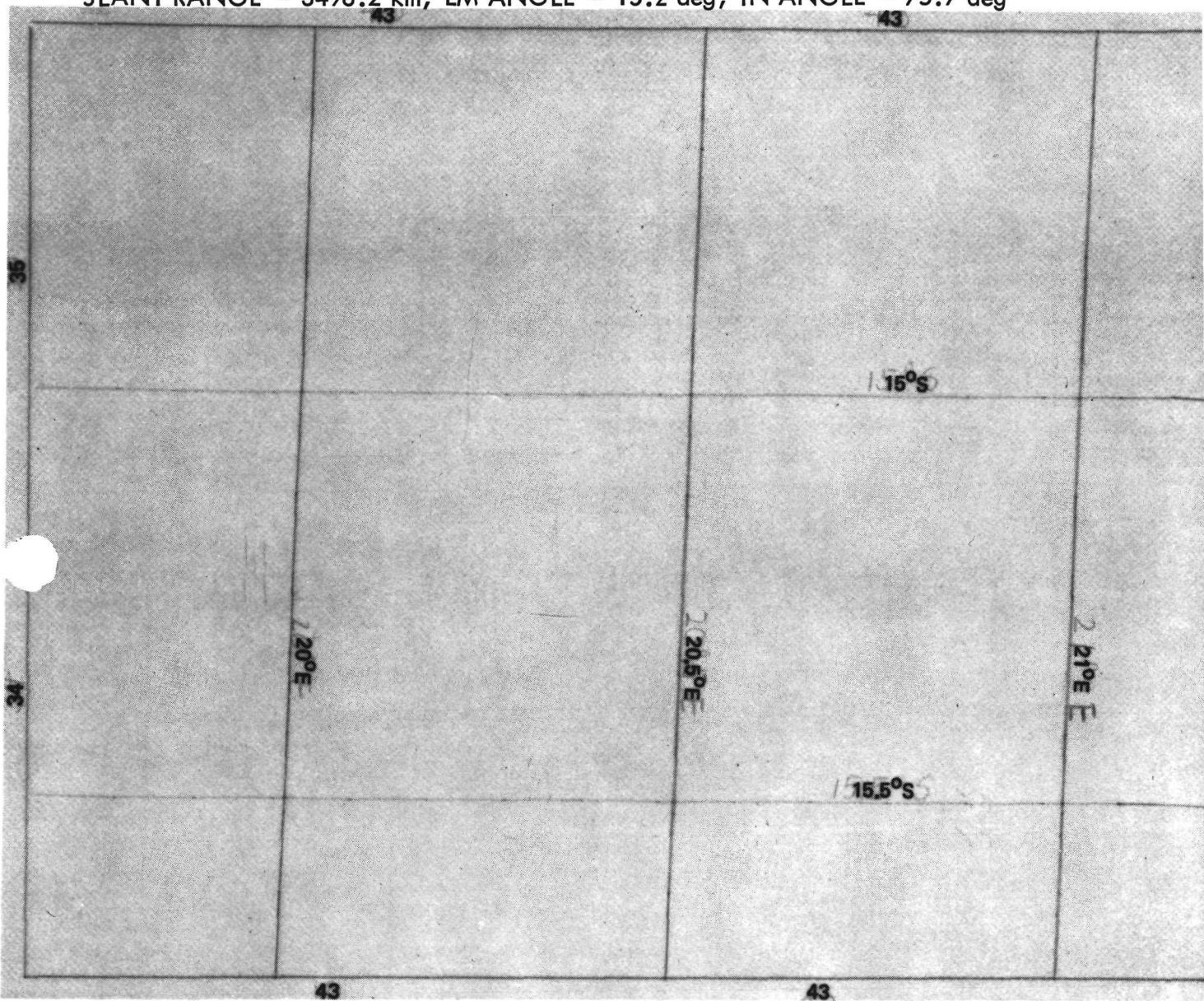
6 NE 22

SHUTTERED E+ 0 min 47.8 sec

CONE ANGLE = 100.04 deg, CLOCK ANGLE = 265.90 deg, TWIST ANGLE = -0.21 deg

LAT OF CENTER = -15.1 deg, LONG OF CENTER = 20.4 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 3498.2 km, EM ANGLE = 15.2 deg, IN ANGLE = 75.7 deg



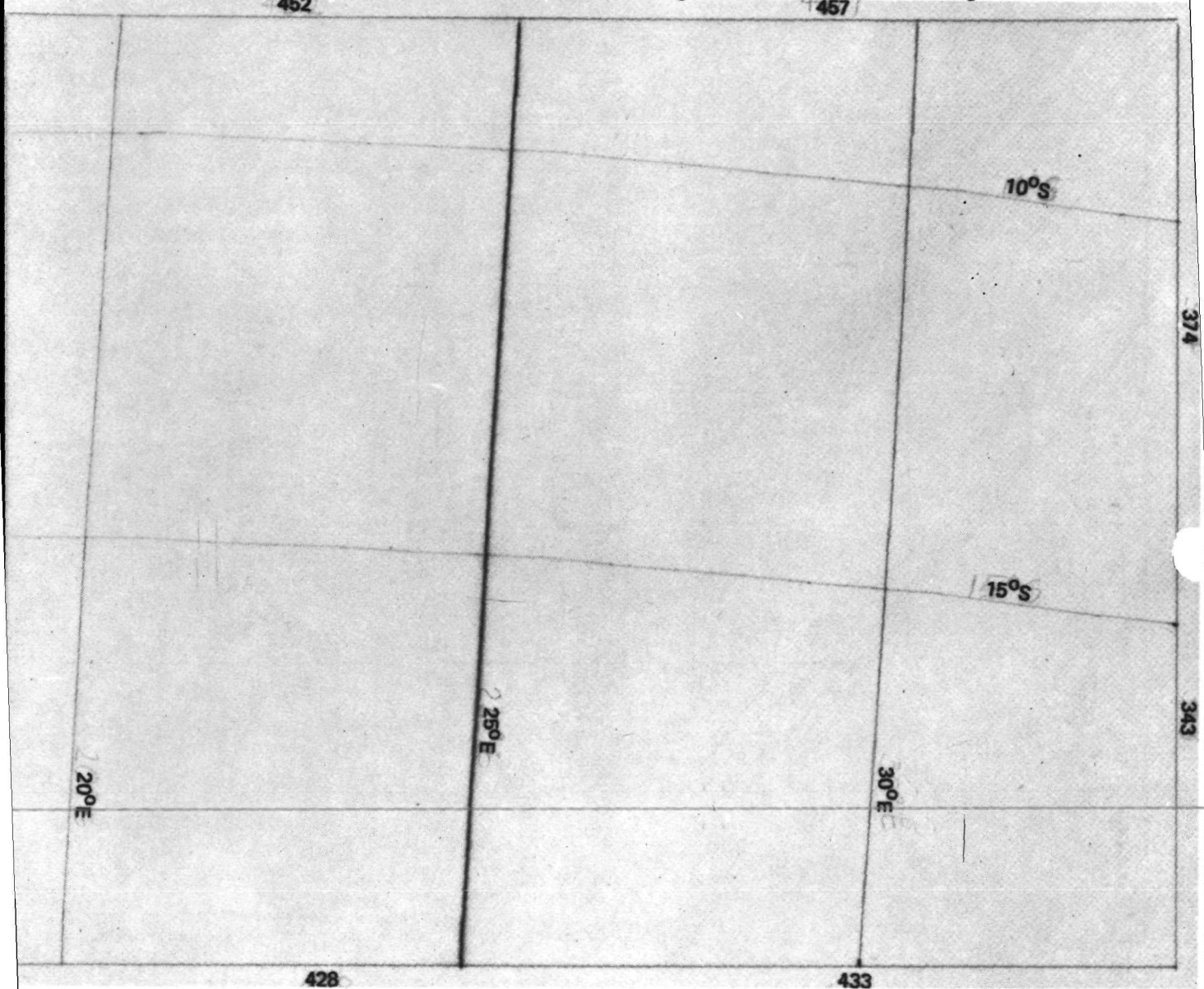
6 NE 23

SHUTTERED E+ 1 min 30.1 sec

CONE ANGLE = 100.01 deg, CLOCK ANGLE = 265.92 deg, TWIST ANGLE = -0.09 deg

LAT OF CENTER = -14.2 deg, LONG OF CENTER = 26.3 deg, GRID SPACING = 5 deg

SLANT RANGE = 3522.4 km, EM ANGLE = 15.1 deg, IN ANGLE = 81.6 deg



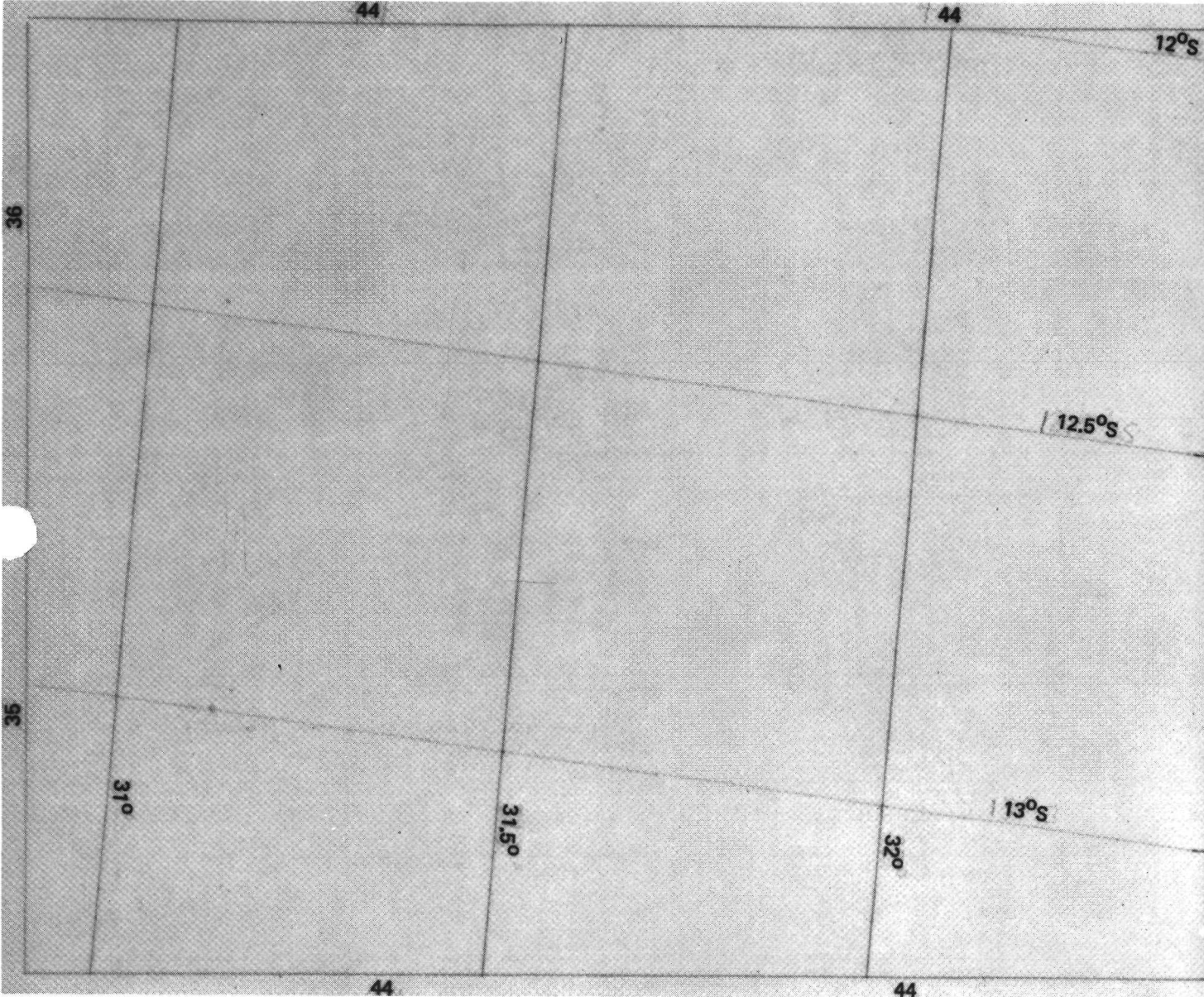
6 NE 24

SHUTTERED E+ 2 min 12.3 sec

CONE ANGLE = 100.06 deg, CLOCK ANGLE = 265.92 deg, TWIST ANGLE = -0.08 deg

LAT OF CENTER = -12.7 deg, LONG OF CENTER = 31.6 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 3584.0 km, EM ANGLE = 17.5 deg, IN ANGLE = 87.1 deg



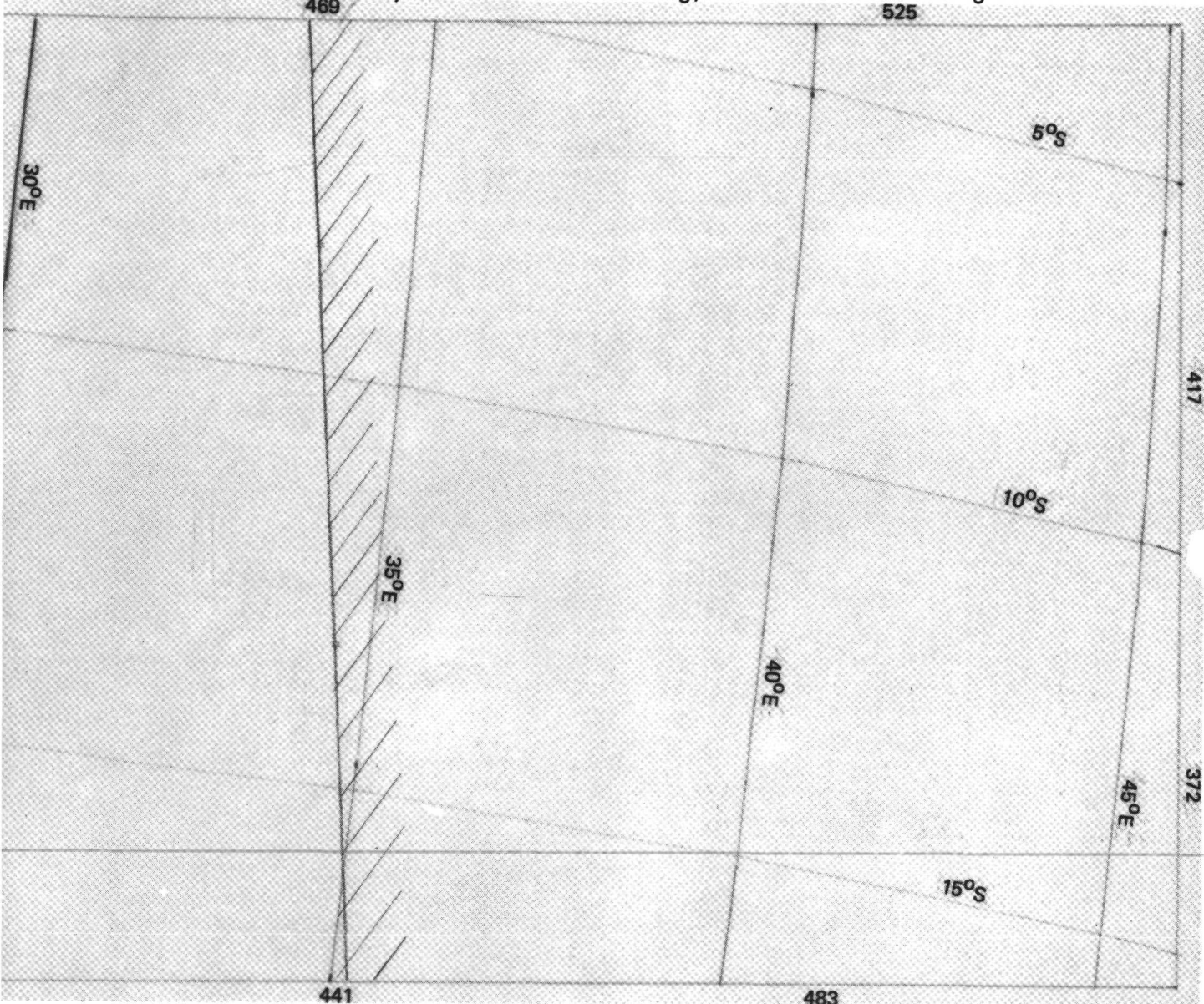
6 NE 25

SHUTTERED E+ 2 min 54.6 sec

CONE ANGLE = 100.11 deg, CLOCK ANGLE = 265.92 deg, TWIST ANGLE = -0.07 deg

LAT OF CENTER = -11.1 deg, LONG OF CENTER = 37.5 deg, GRID SPACING = 5 deg

SLANT RANGE = 3680.4 km, EM ANGLE = 21.5 deg, IN ANGLE = 93.2 deg



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MARINER 7 FAR-ENCOUNTER CONIC PROJECTIONS

KEY: E sub-earth point
 S sub-spacecraft point
 Z sub-solar point
 P Phobos
 D Deimos
 * terminator

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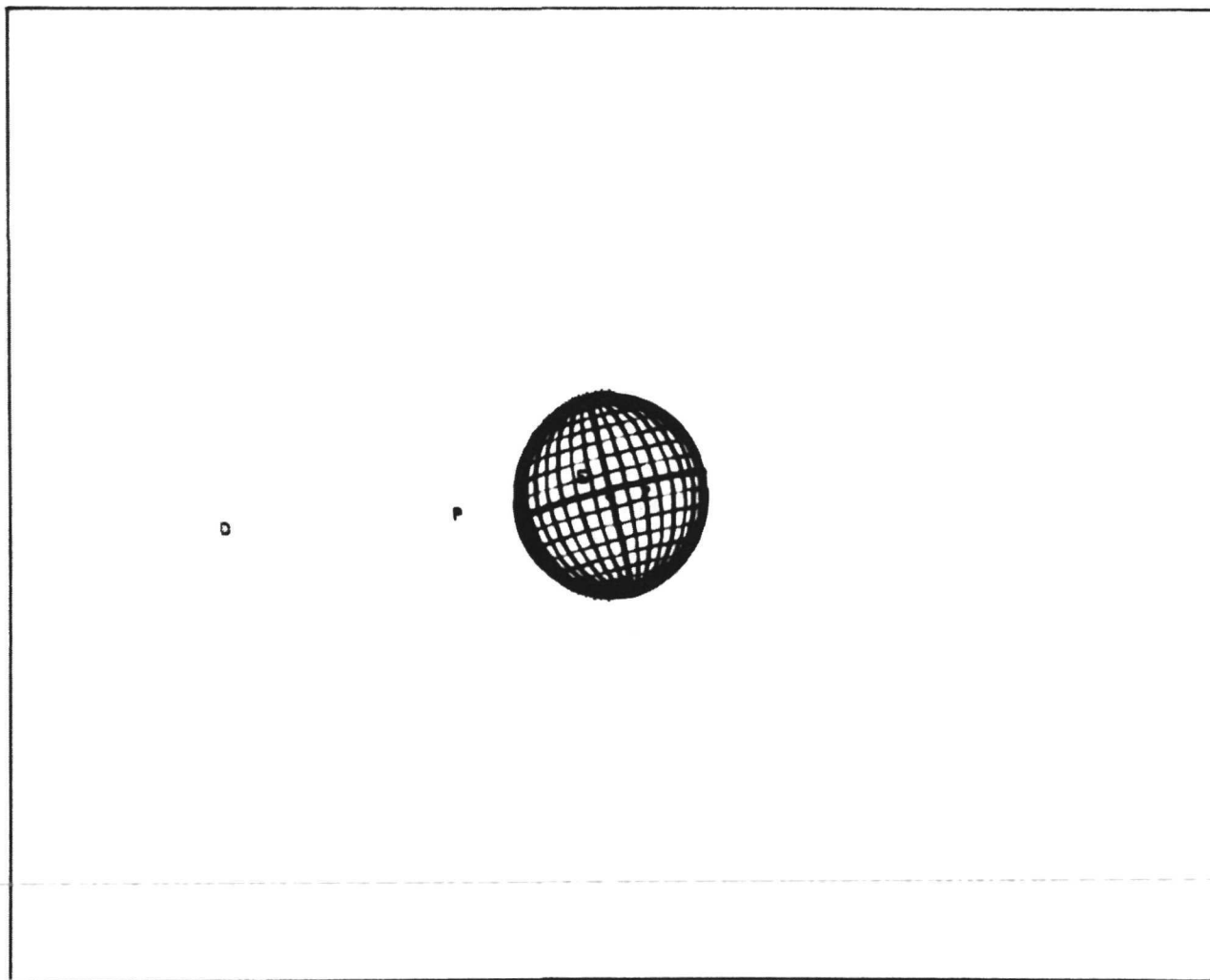
7 FE 1

SHUTTERED 2 AUG 9 hr 32 min 16.564 sec (GMT)

ENCOUNTER MINUS 67 hr 28 min 32.329 sec

S/C ALTITUDE 1,716,977 km, LONG. OF SUB-S/C POINT 239.30 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 46.9 km



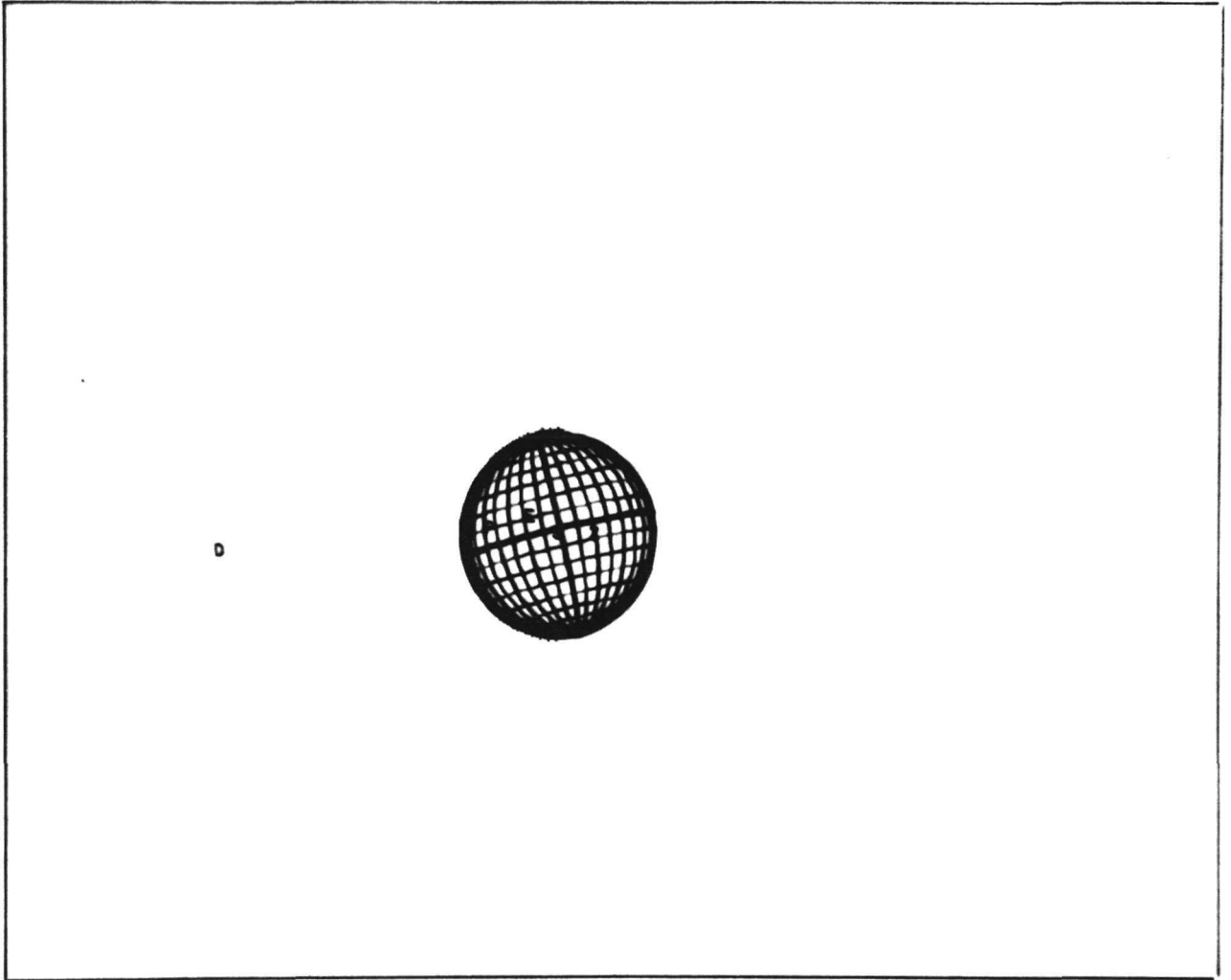
7 FE 2

SHUTTERED 2 AUG 9 hr 59 min 27.391 sec (GMT)

ENCOUNTER MINUS 67 hr 1 min 21.502 sec

S/C ALTITUDE 1,705,627 km, LONG. OF SUB-S/C POINT 232.79 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 46.6 km



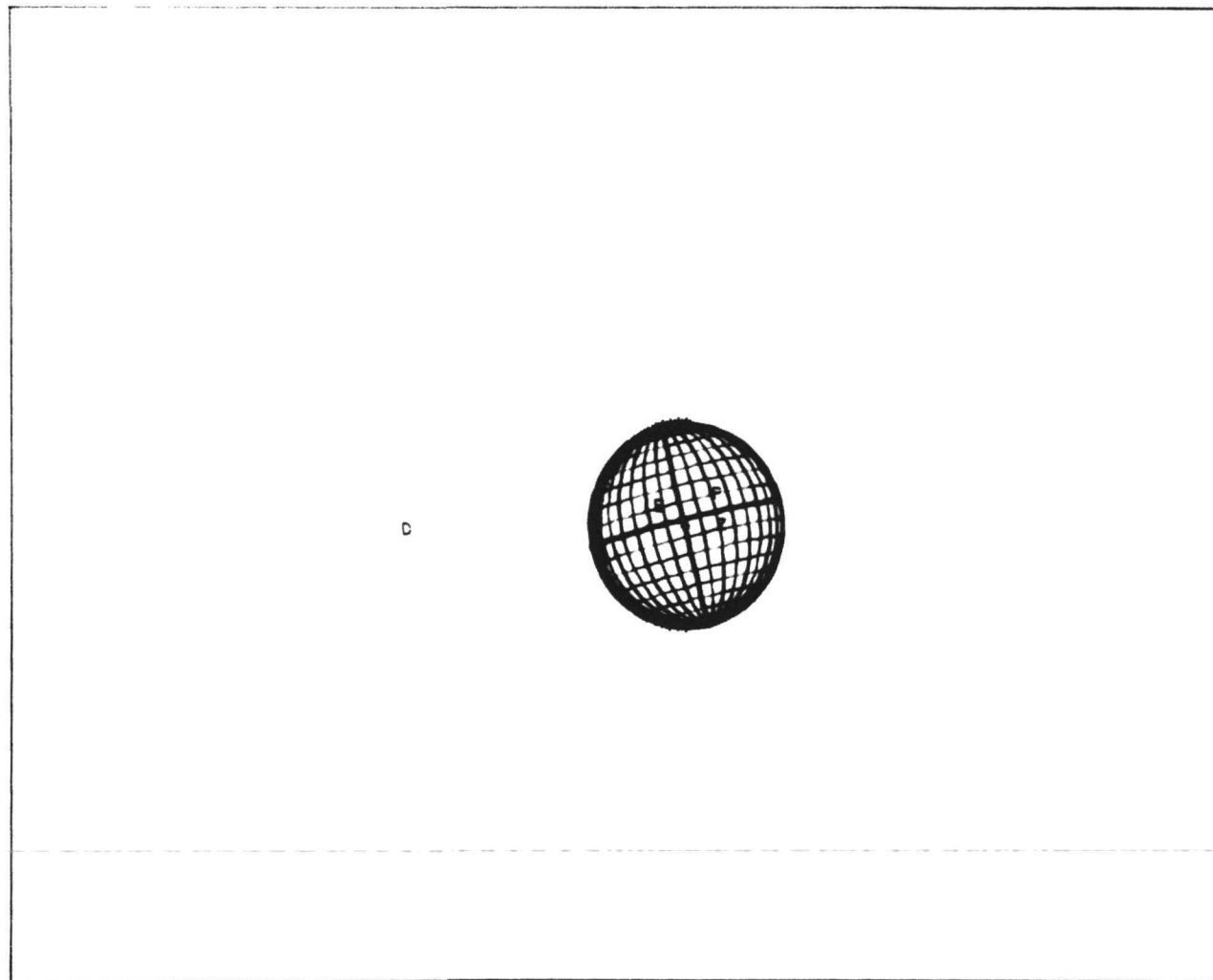
7 FE 3

SHUTTERED 2 AUG 10 hr 27 min 37.039 sec (GMT)

ENCOUNTER MINUS 66 hr 33 min 11.854 sec

S/C ALTITUDE 1,693,679 km, LONG. OF SUB-S/C POINT 225.94 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 46.3 km



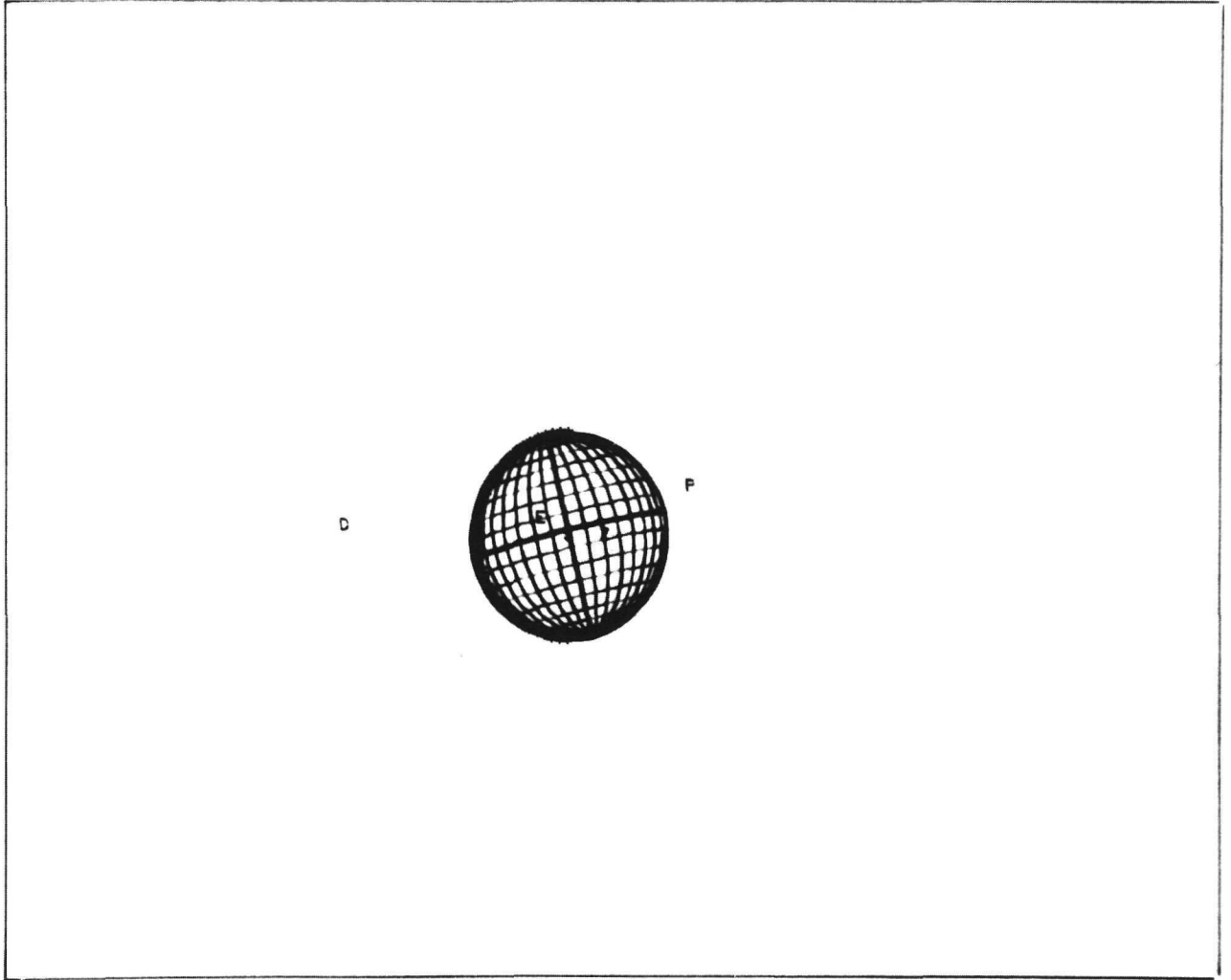
7 FE 4

SHUTTERED 2 AUG 10 hr 54 min 22.204 sec (GMT)

ENCOUNTER MINUS 66 hr 6 min 26.689 sec

S/C ALTITUDE 1,682,329 km, LONG. OF SUB-S/C POINT 219.43 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 46.0 km



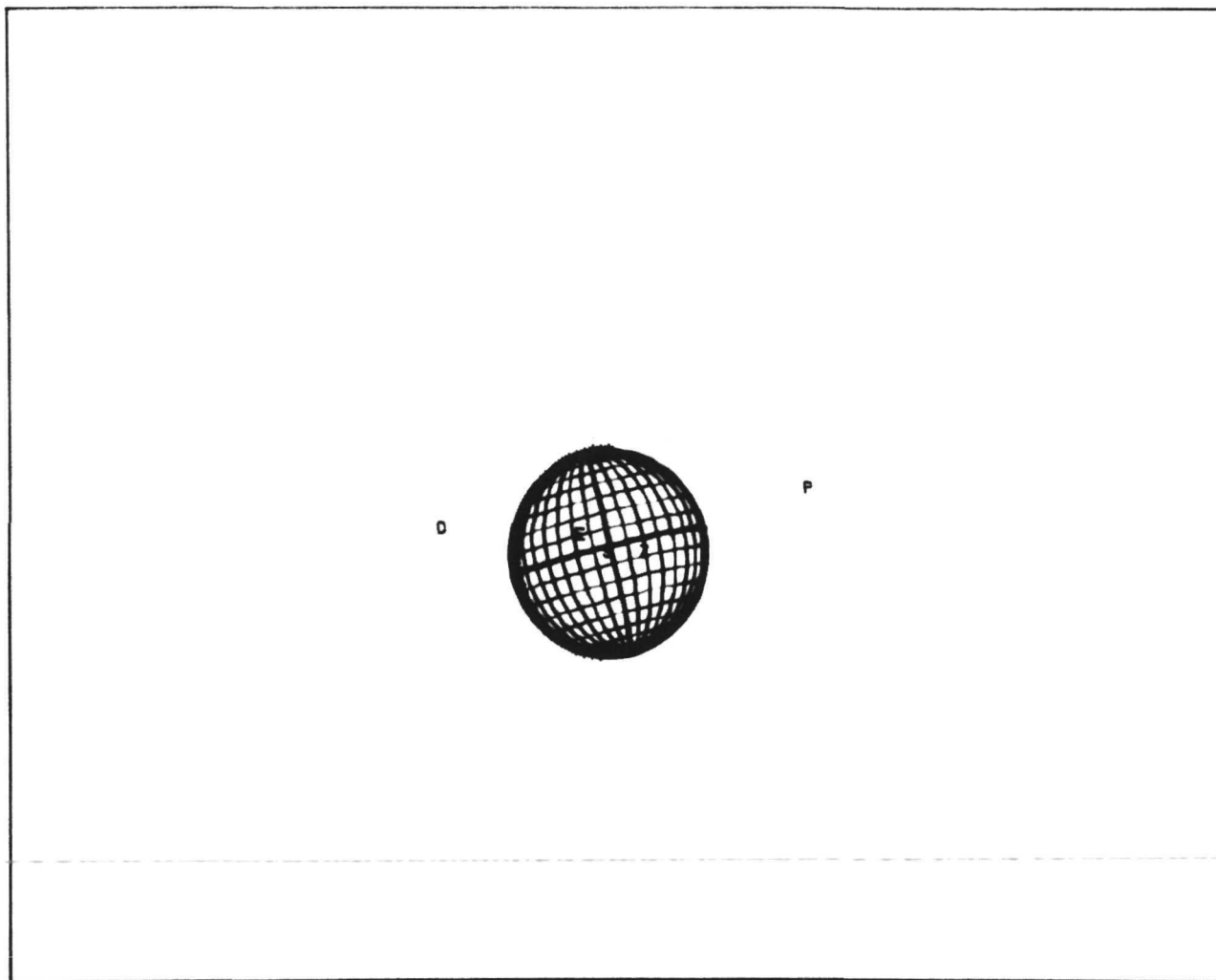
7 FE 5

SHUTTERED 2 AUG 11 hr 21 min 7.370 sec (GMT)

ENCOUNTER MINUS 65 hr 39 min 41.523 sec

S/C ALTITUDE 1,670,977 km, LONG. OF SUB-S/C POINT 212.92 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 45.7 km



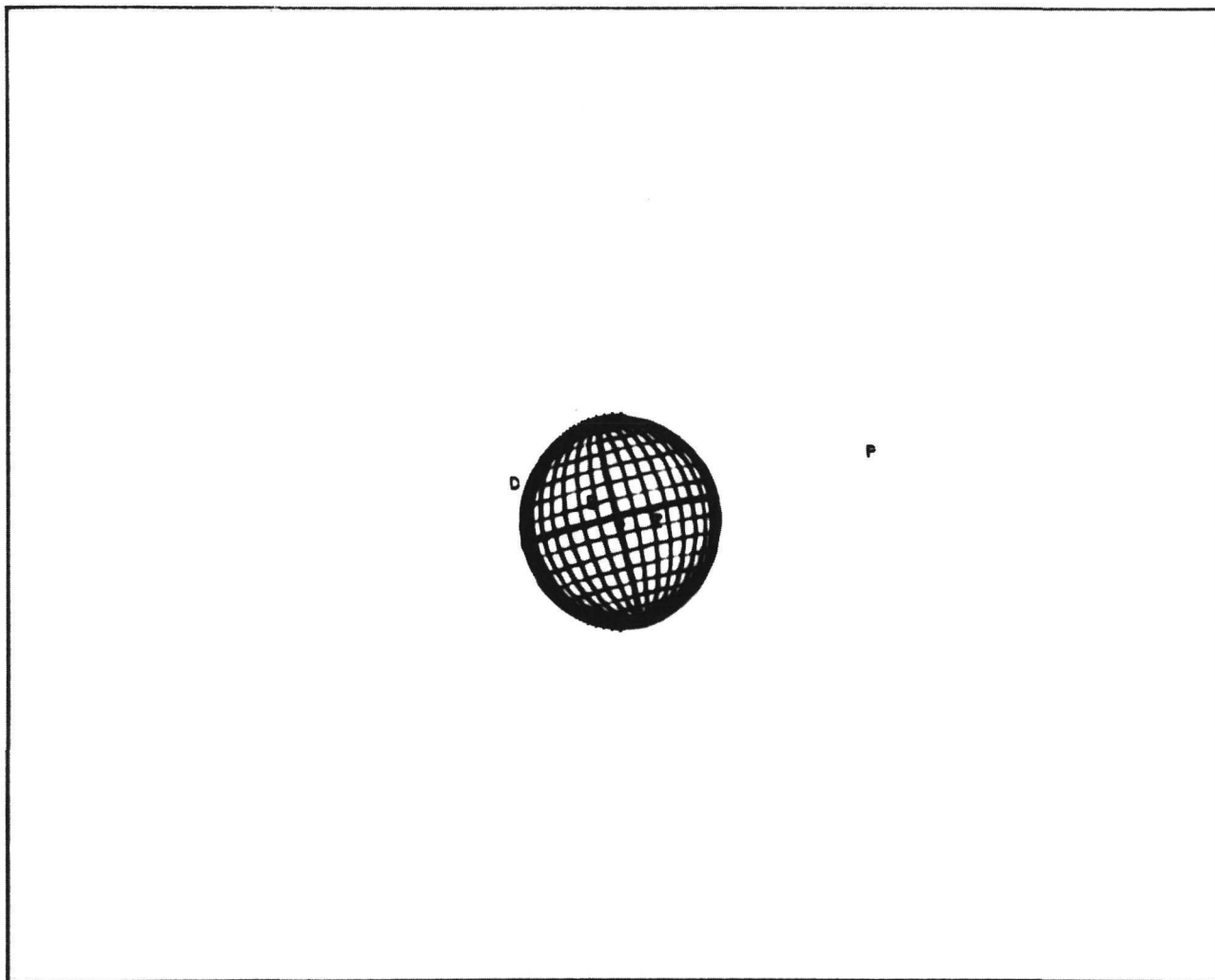
7 FE 6

SHUTTERED 2 AUG 11 hr 47 min 52.535 sec (GMT)

ENCOUNTER MINUS 65 hr 12 min 56.358 sec

S/C ALTITUDE 1,659,628 km, LONG. OF SUB-S/C POINT 206.41 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 45.3 km



7 FE 7

SHUTTERED 2 AUG 12 hr 14 min 37.699 sec (GMT)

ENCOUNTER MINUS 64 hr 46 min 11.194 sec

S/C ALTITUDE 1,648,276 km, LONG. OF SUB-S/C POINT 199.90 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 45.0 km



P

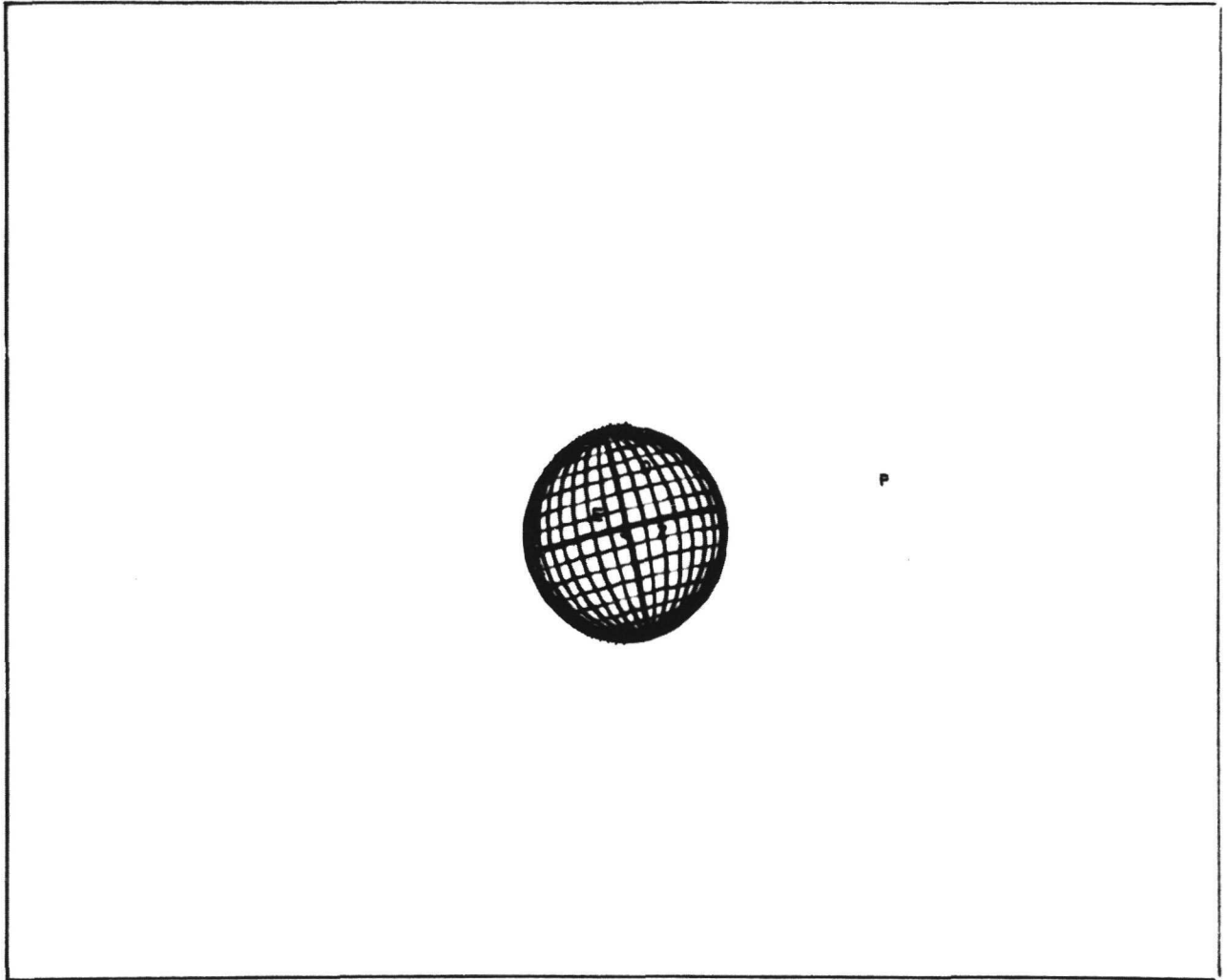
7 FE 8

SHUTTERED 2 AUG 12 hr 41 min 22.866 sec (GMT)

ENCOUNTER MINUS 64 hr 19 min 26.027 sec

S/C ALTITUDE 1,636,927 km, LONG. OF SUB-S/C POINT 193.39 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 44.7 km



7 FE 9

SHUTTERED 2 AUG 13 hr 9 min 32.512 sec (GMT)

ENCOUNTER MINUS 63 hr 51 min 16.381 sec

S/C ALTITUDE 1,624,978 km, LONG. OF SUB-S/C POINT 186.54 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 44.4 km



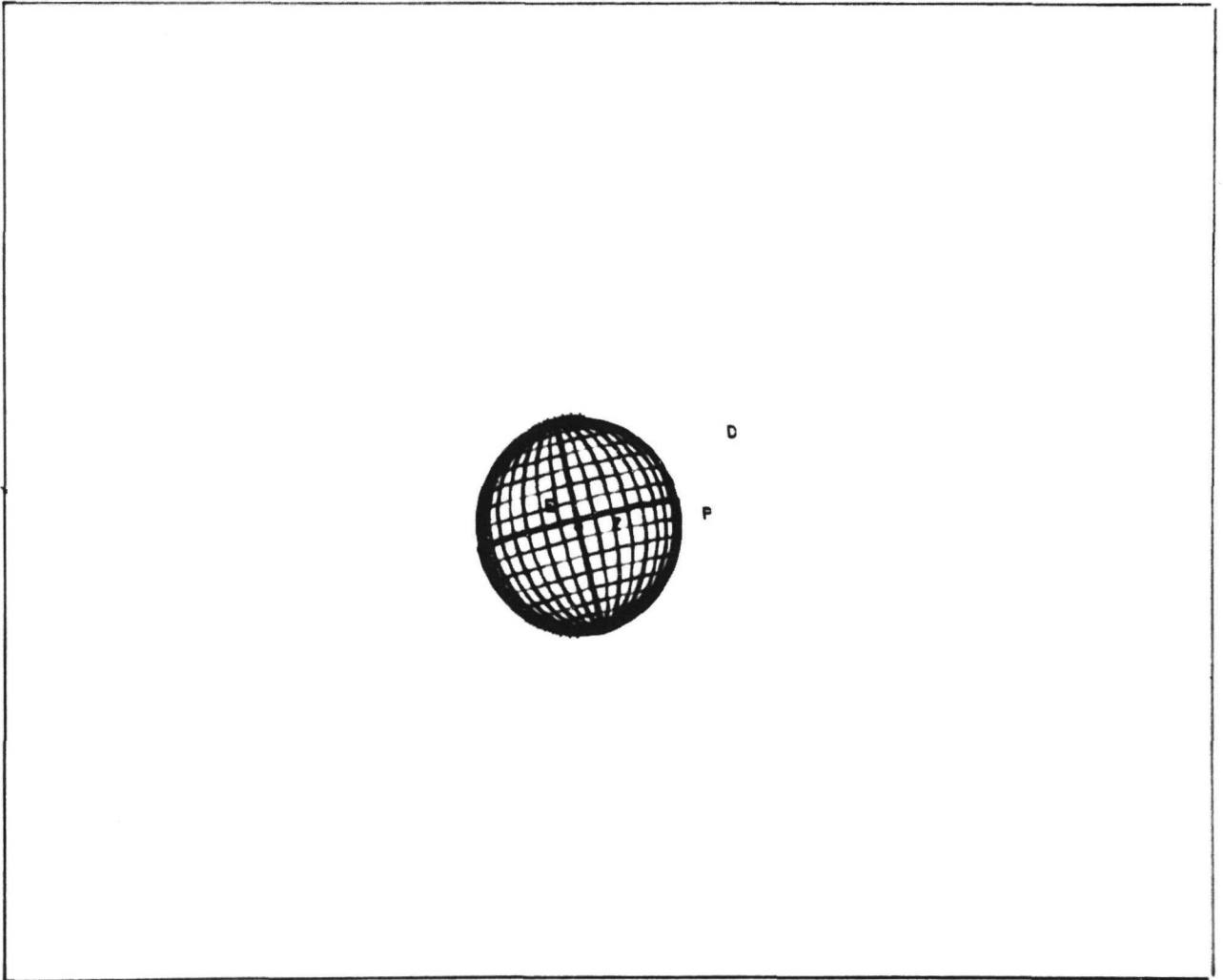
7 FE 10

SHUTTERED 2 AUG 13 hr 36 min 17.680 sec (GMT)

ENCOUNTER MINUS 63 hr 24 min 31.213 sec

S/C ALTITUDE 1,613,630 km, LONG. OF SUB-S/C POINT 180.03 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 44.1 km



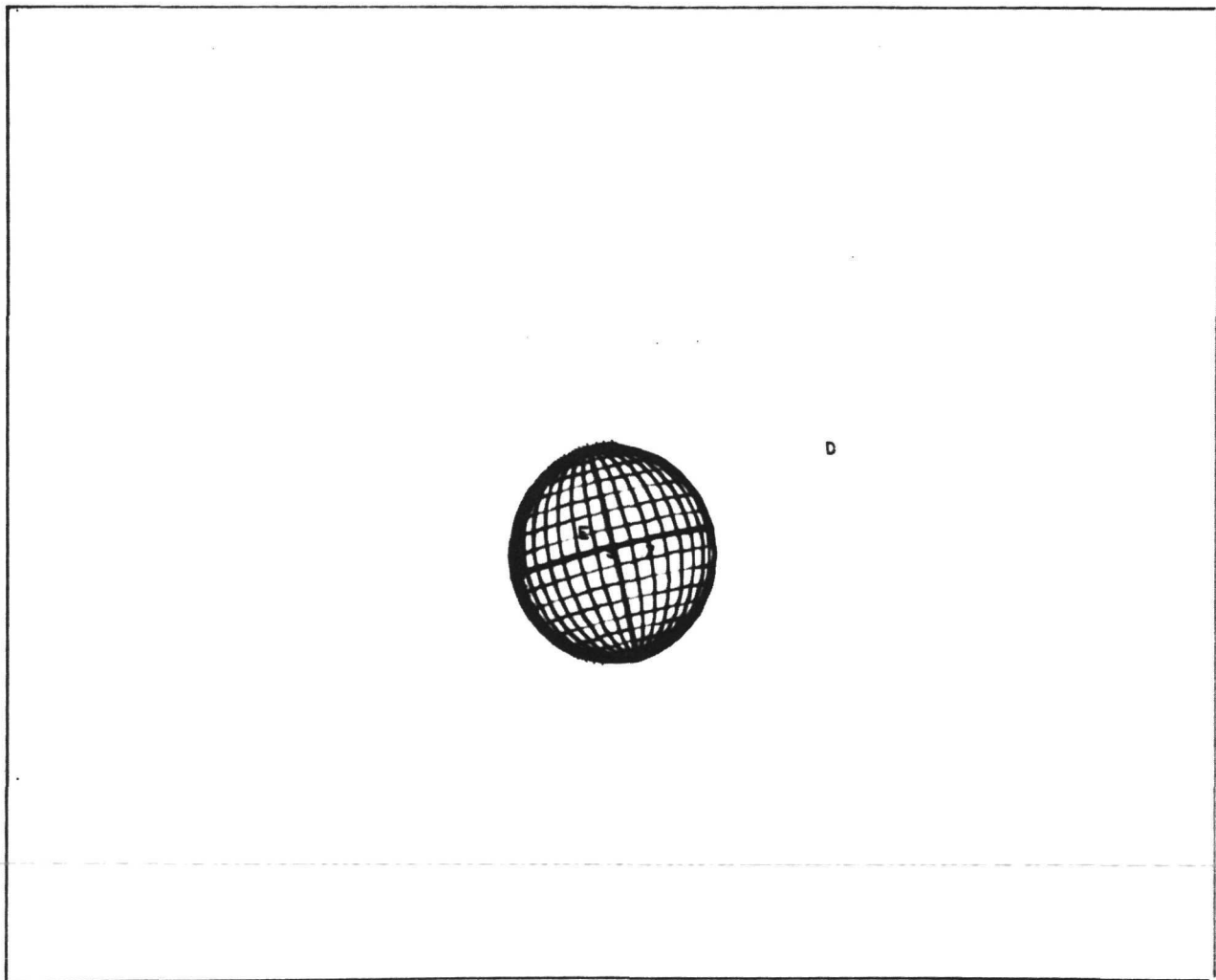
7 FE 11

SHUTTERED 2 AUG 14 hr 3 min 2.843 sec (GMT)

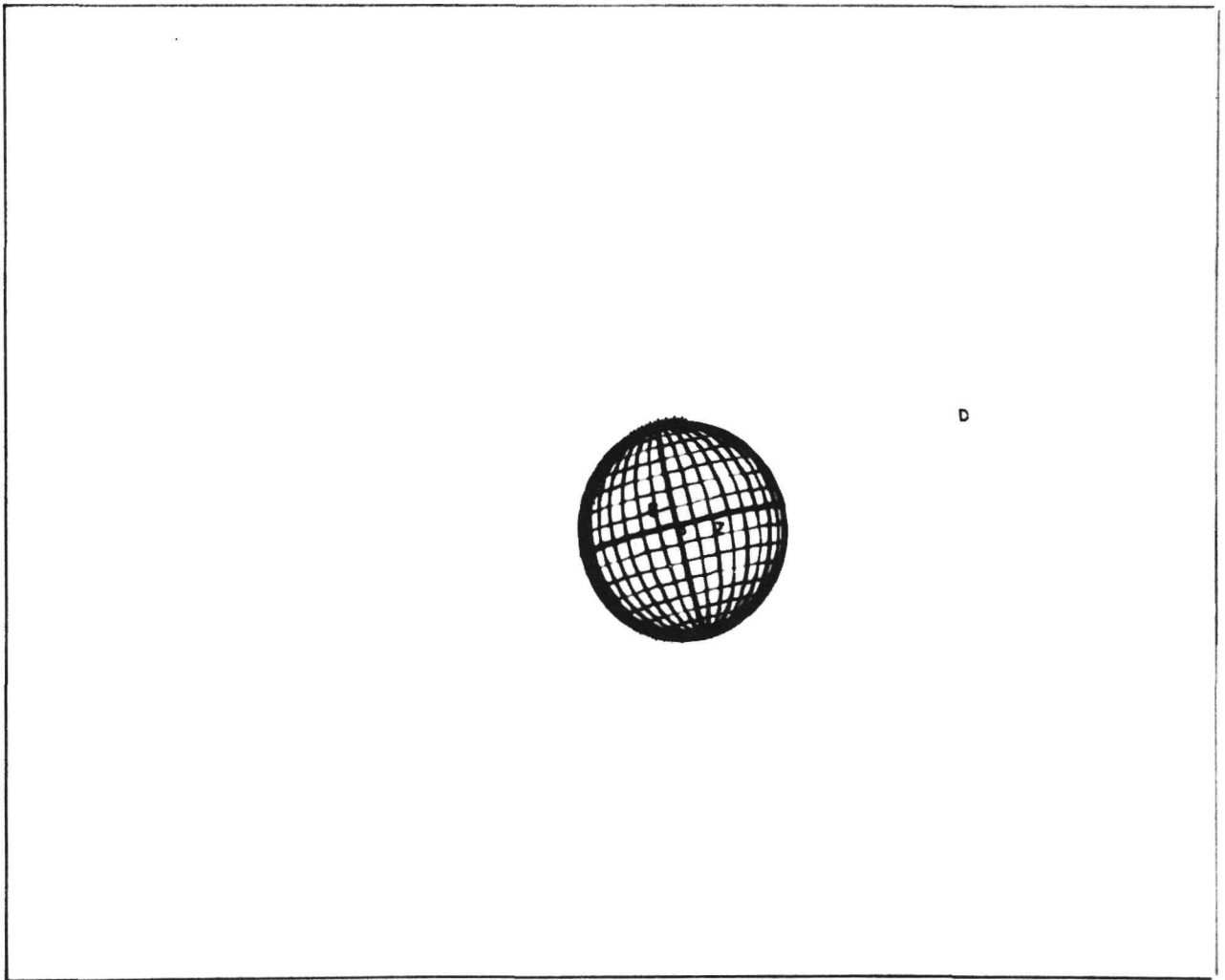
ENCOUNTER MINUS 62 hr 57 min 46.050 sec

S/C ALTITUDE 1,602,277 km, LONG. OF SUB-S/C POINT 173.52 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 43.8 km



7 FE 12
SHUTTERED 2 AUG 14 hr 29 min 48.008 sec (GMT)
ENCOUNTER MINUS 62 hr 31 min 0.885 sec
S/C ALTITUDE 1,590,928 km, LONG. OF SUB-S/C POINT 167.01 deg EAST
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 43.5 km



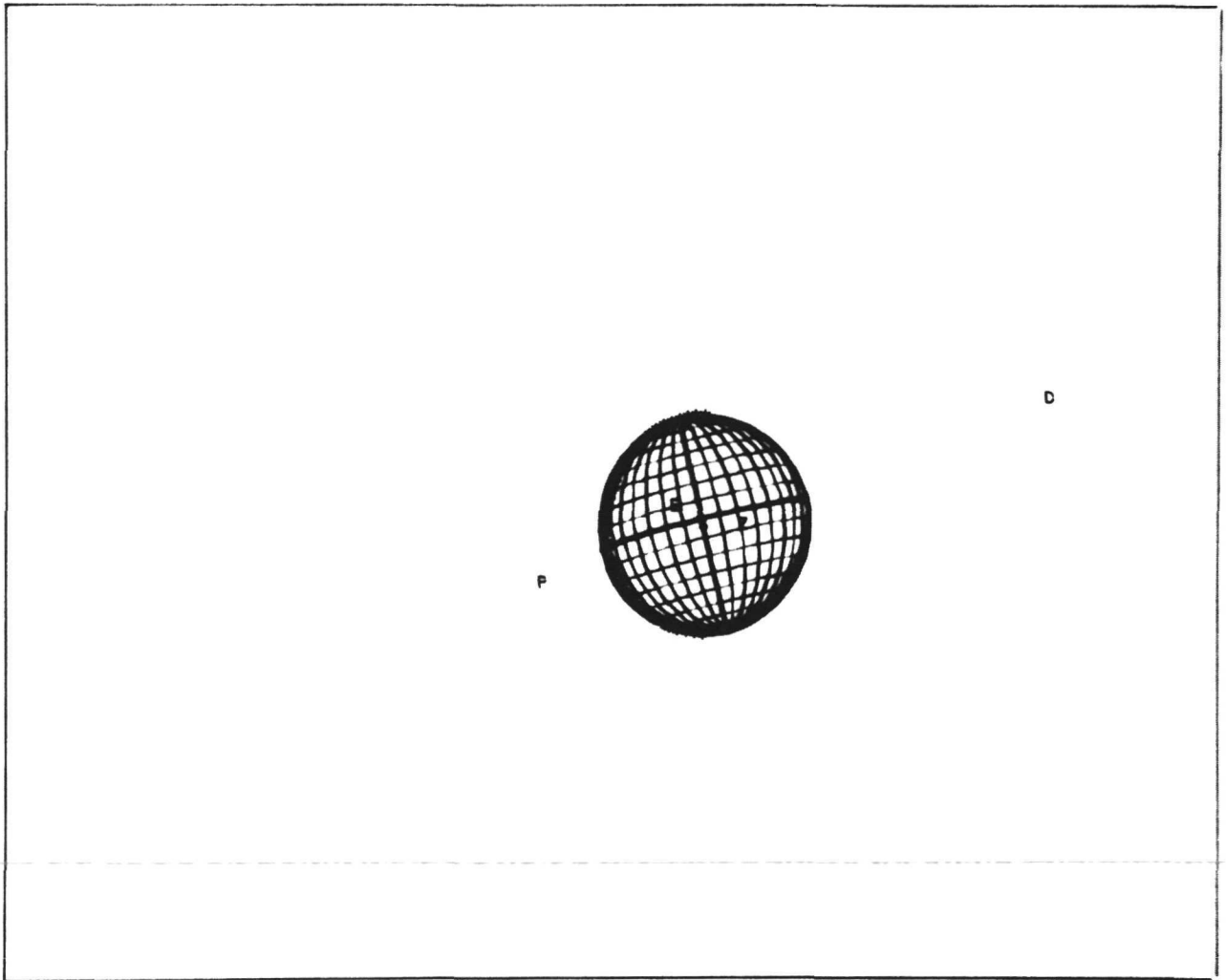
7 FE 13

SHUTTERED 2 AUG 14 hr 56 min 33.175 sec (GMT)

ENCOUNTER MINUS 62 hr 4 min 15.718 sec

S/C ALTITUDE 1,579,577 km, LONG. OF SUB-S/C POINT 160.50 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 43.2



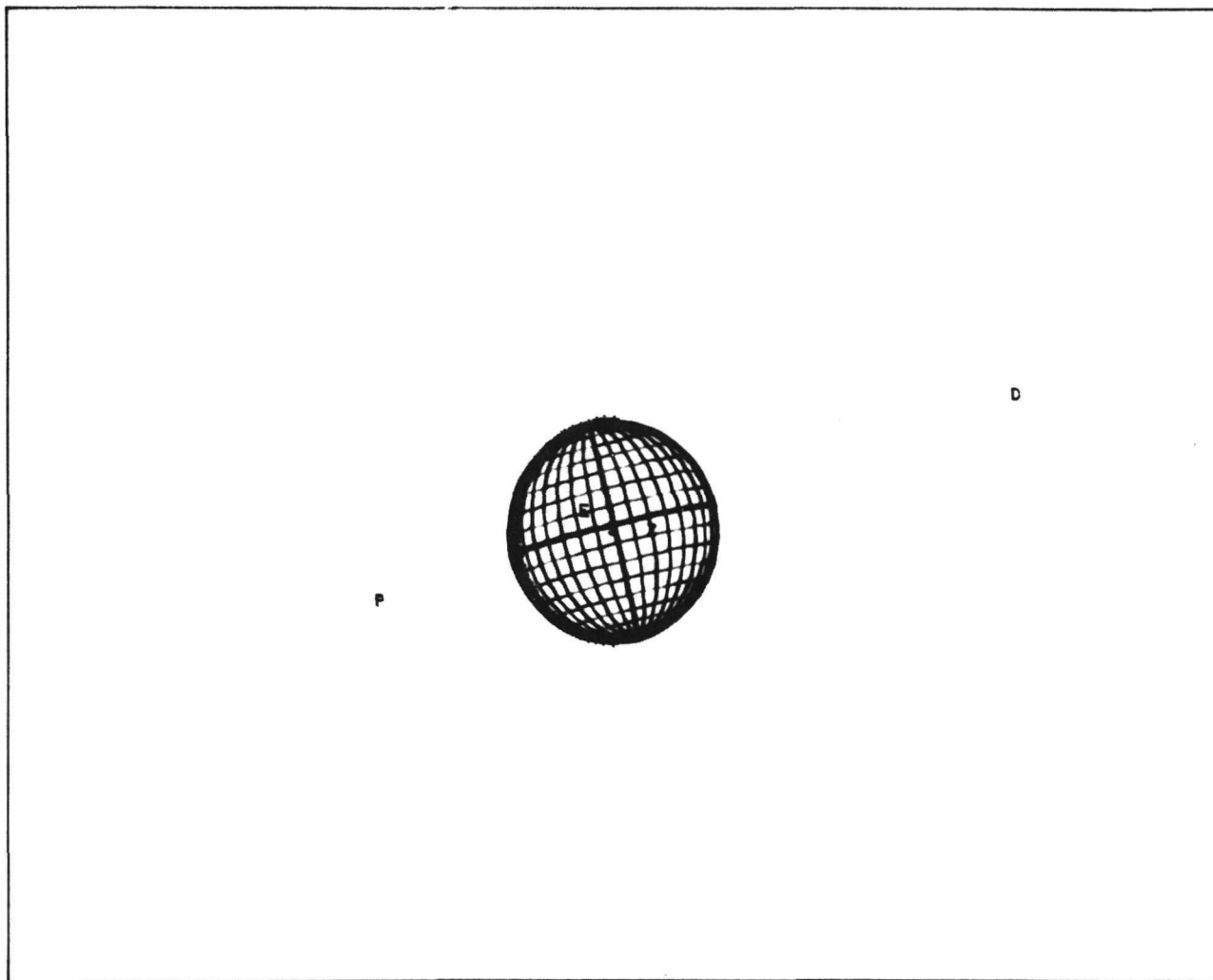
7 FE 14

SHUTTERED 2 AUG 15 hr 23 min 18.341 sec (GMT)

ENCOUNTER MINUS 61 hr 37 min 30.552 sec

S/C ALTITUDE 1,568,227 km, LONG. OF SUB-S/C POINT 153.99 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 42.9 km



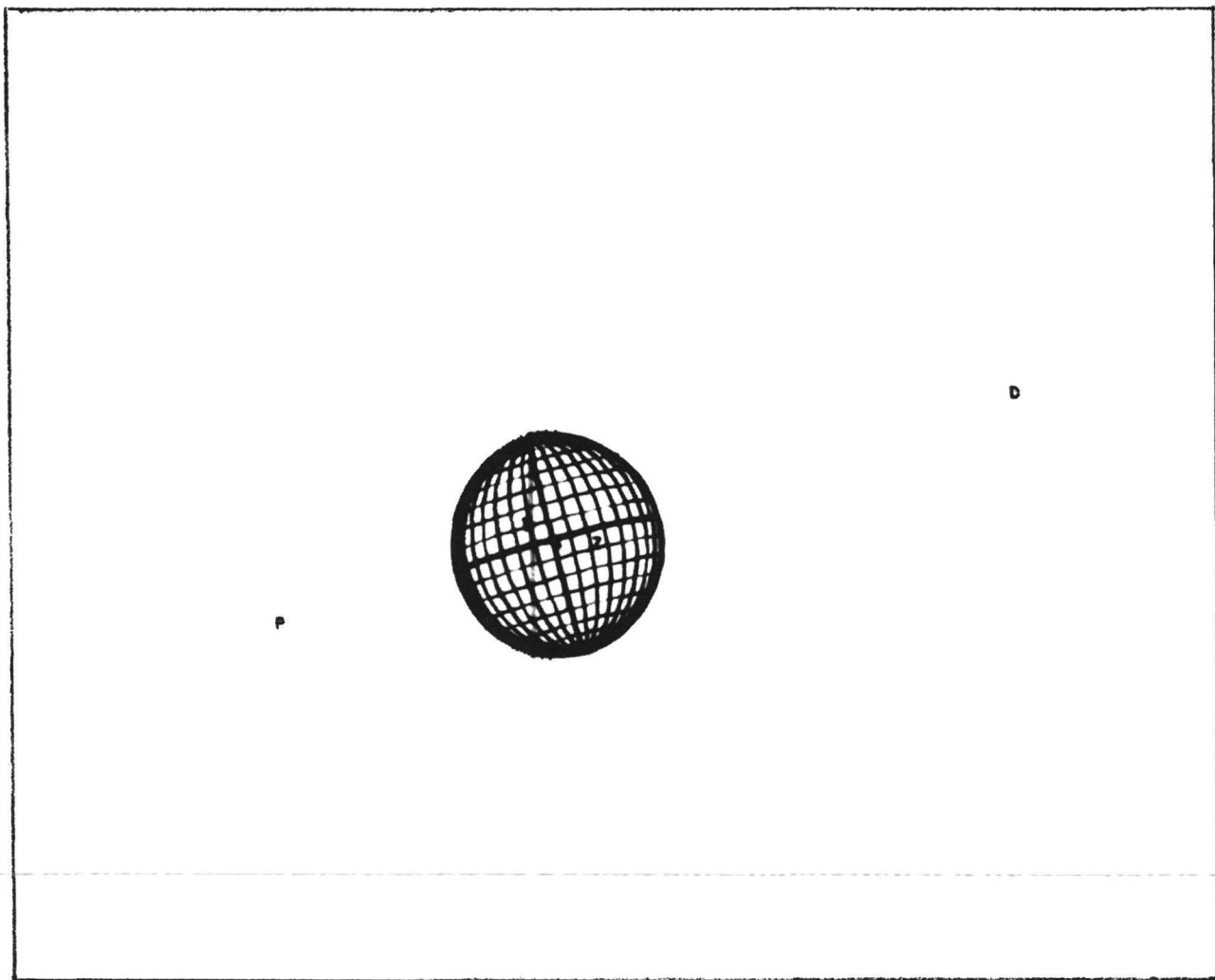
7 FE 15

SHUTTERED 2 AUG 15 hr 51 min 27.987 sec (GMT)

ENCOUNTER MINUS 61 hr 9 min 20.906 sec

S/C ALTITUDE 1,556,280 km, LONG. OF SUB-S/C POINT 147.02 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 42.5 km



7 FE 16
SHUTTERED 2 AUG 16 hr 18 min 13.153 sec (GMT)
ENCOUNTER MINUS 60 hr 42 min 35.740 sec
S/C ALTITUDE 1,544,930 km, LONG. OF SUB-S/C POINT 140.51 deg EAST
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 42.2 km



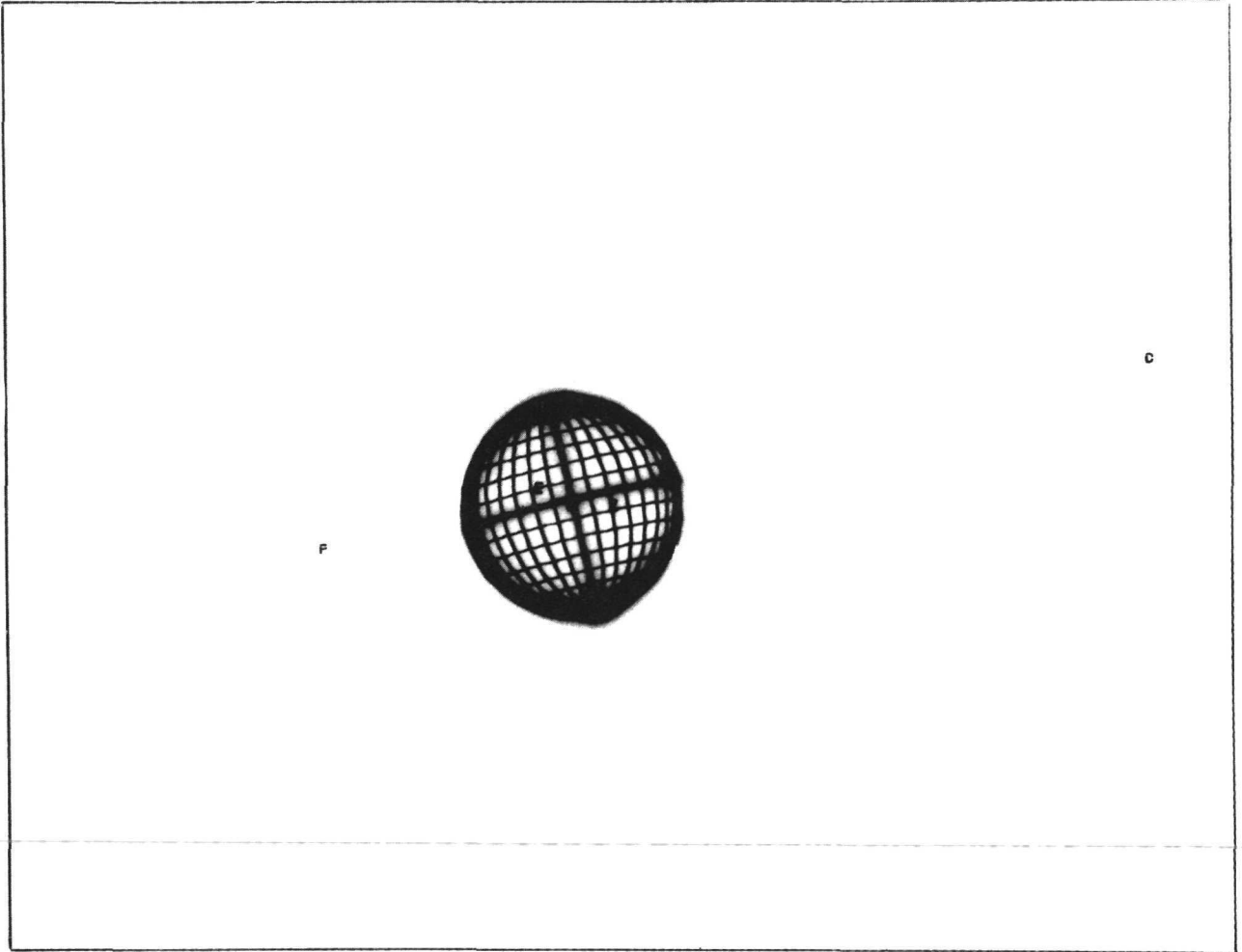
7 FE 17

SHUTTERED 2 AUG 16 hr 44 min 58.318 sec (GMT)

ENCOUNTER MINUS 60 hr 15 min 50.575 sec

S/C ALTITUDE 1,533,580 km, LONG. OF SUB-S/C POINT 134.00 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 41.9 km



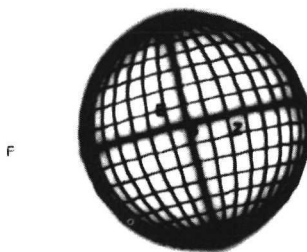
7 FE 18

SHUTTERED 2 AUG 17 hr 11 min 43.484 sec (GMT)

ENCOUNTER MINUS 59 hr 49 min 5.409 sec

S/C ALTITUDE 1,522,230 km, LONG. OF SUB-S/C POINT 127.49 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 41.6 km



7 FE 19

SHUTTERED 2 AUG 17 hr 38 min 43.649 sec (GMT)

ENCOUNTER MINUS 59 hr 22 min 5.244 sec

S/C ALTITUDE 1,510,774 km, LONG. OF SUB-S/C POINT 120.92 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 41.3 km



7 FE 20
SHUTTERED 2 AUG 18 hr 5 min 13.816 sec (GMT)
ENCOUNTER MINUS 58 hr 55 min 35.077 sec
S/C ALTITUDE 1,499,530 km, LONG. OF SUB-S/C POINT 114.47 deg EAST
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 41.0 km



7 FE 21

SHUTTERED 2 AUG 18 hr 33 min 23.464 sec (GMT)

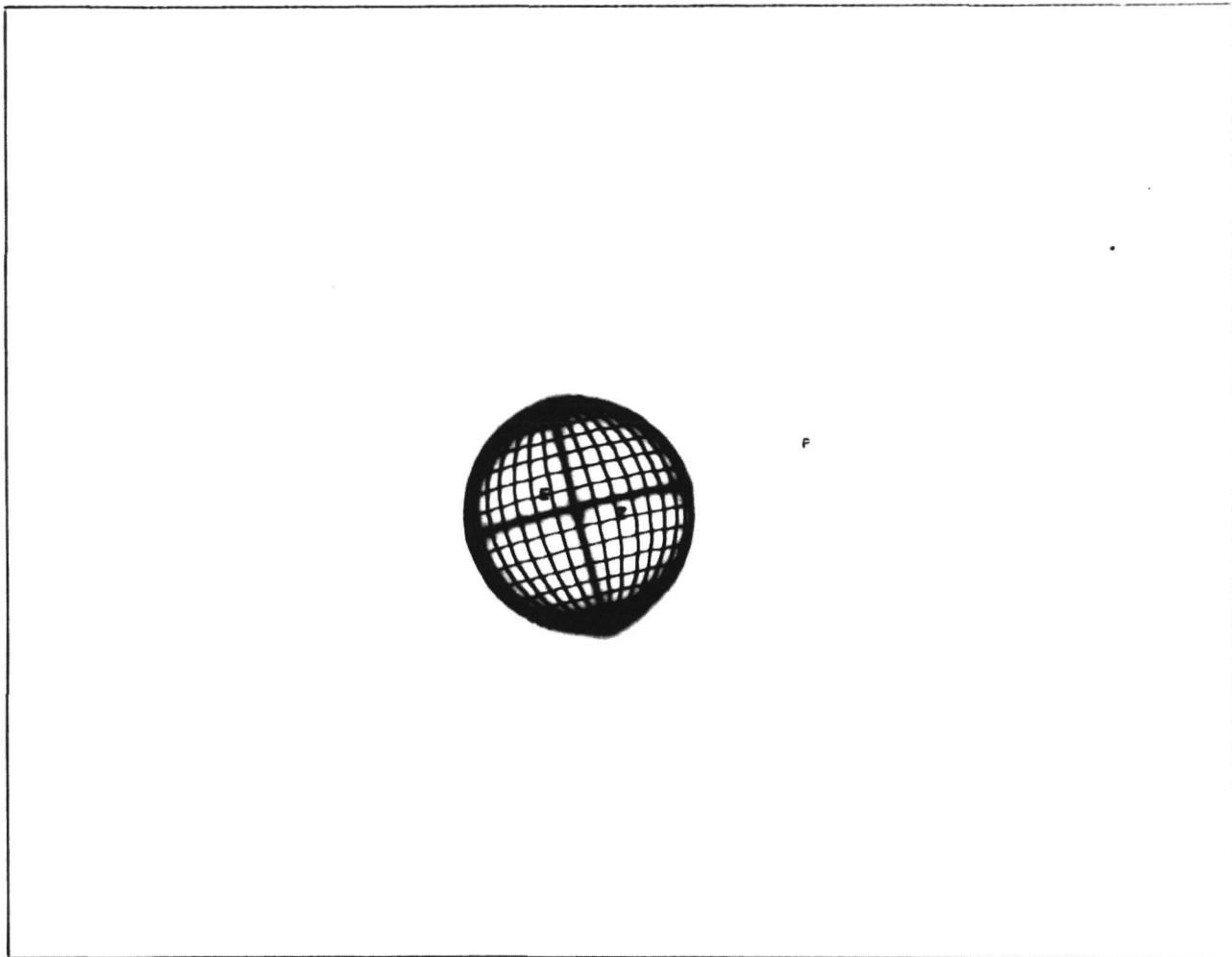
ENCOUNTER MINUS 58 hr 27 min 25.429 sec

S/C ALTITUDE 1,487,584 km, LONG. OF SUB-S/C POINT 107.61 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 40.7 km



7 FE 22
SHUTTERED 2 AUG 19 hr 0 min 8.628 sec (GMT)
ENCOUNTER MINUS 58 hr 0 min 40.268 sec
S/C ALTITUDE 1,476,233 km, LONG. OF SUB-S/C POINT 101.1 deg EAST
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 40.4 km



7 FE 23

SHUTTERED 2 AUG 19 hr 26 min 53.793 sec (GMT)

ENCOUNTER MINUS 57 hr 33 min 55.100 sec

S/C ALTITUDE 1,464,885 km, LONG. OF SUB-S/C POINT 94.59 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 40.1 km



F

7 FE 24

SHUTTERED 2 AUG 19 hr 53 min 38.961 sec (GMT)

ENCOUNTER MINUS 57 hr 7 min 9.932 sec

S/C ALTITUDE 1,453,533 km, LONG. OF SUB-S/C POINT 88.08 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 39.8 km



7 FE 25

SHUTTERED 2 AUG 20 hr 20 min 24.126 sec (GMT)

ENCOUNTER MINUS 56 hr 40 min 24.767 sec

S/C ALTITUDE 1,442,184 km, LONG. OF SUB-S/C POINT 81.57 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 39.4 km



F

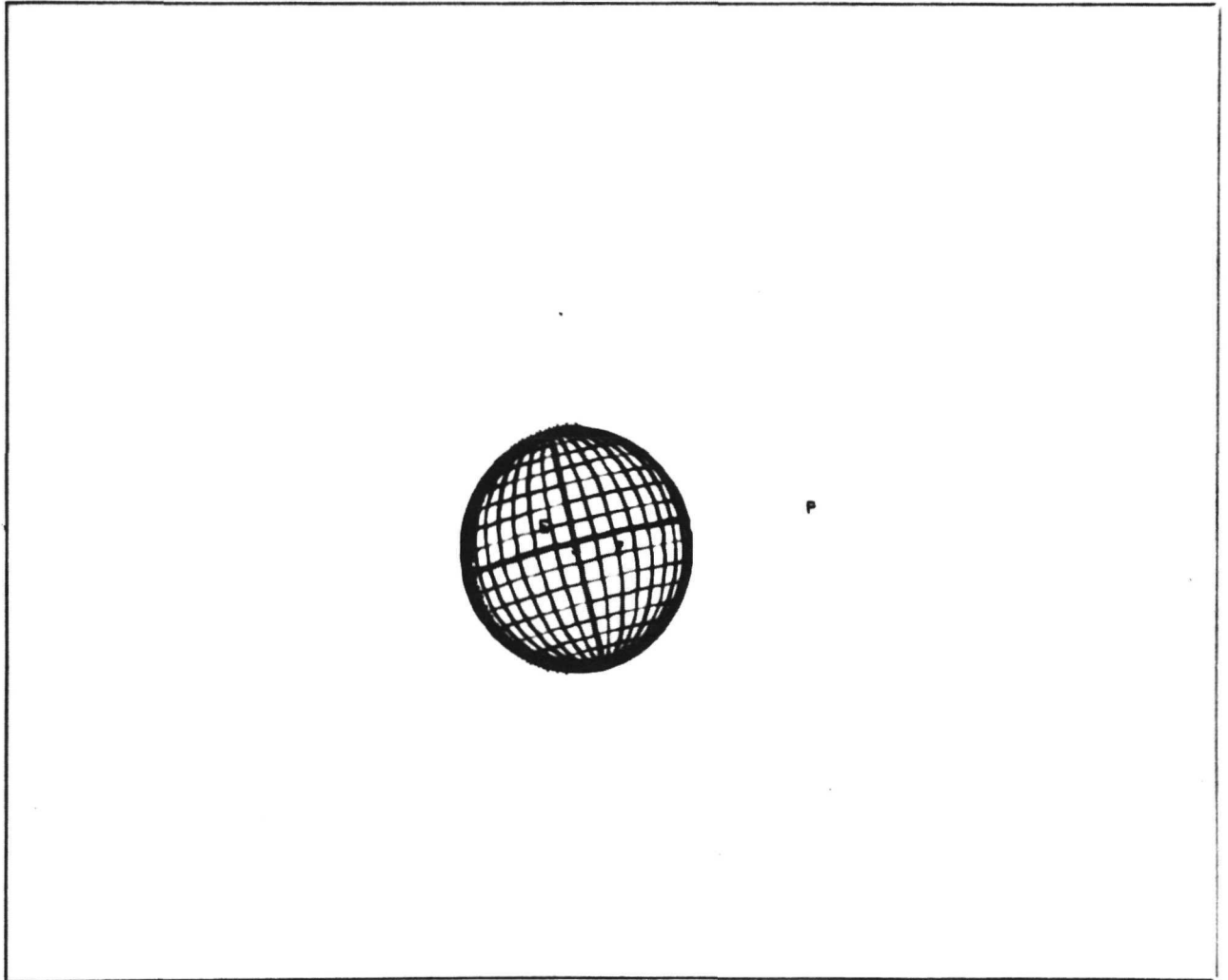
7 FE 26

SHUTTERED 2 AUG 20 hr 48 min 33.774 sec (GMT)

ENCOUNTER MINUS 56 hr 12 min 15.119 sec

S/C ALTITUDE 1,430,237 km, LONG. OF SUB-S/C POINT 74.72 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 39.1 km



7 FE 27

SHUTTERED 2 AUG 21 hr 15 min 18.937 sec (GMT)

ENCOUNTER MINUS 55 hr 45 min 29.956 sec

S/C ALTITUDE 1,418,887 km, LONG. OF SUB-S/C POINT 68.20 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 38.8 km



7 FE 28

SHUTTERED 2 AUG 21 hr 42 min 4.103 sec (GMT)

ENCOUNTER MINUS 55 hr 18 min 44.790 sec

S/C ALTITUDE 1,407,538 km, LONG. OF SUB-S/C POINT 61.69 deg EAST

GRID SPACING ON PLANET 10 deg GEOM PIXEL SPACING 38.5 km



7 FE 29

SHUTTERED 2 AUG 22 hr 8 min 49.268 sec (GMT)

ENCOUNTER MINUS 54 hr 51 min 59.625 sec

S/C ALTITUDE 1,396,188 km, LONG. OF SUB-S/C POINT 55.18 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 38.2 km



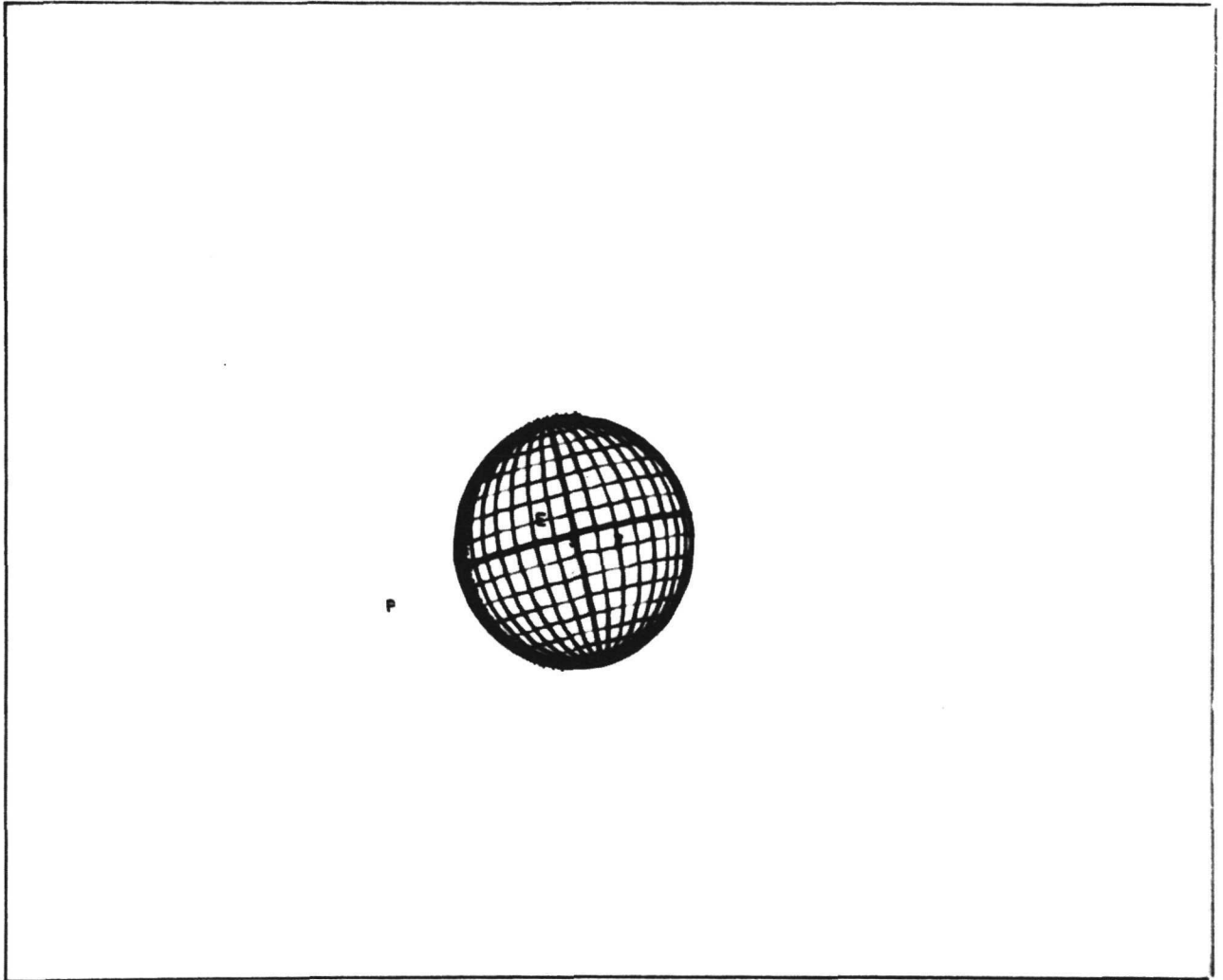
7 FE 30

SHUTTERED 2 AUG 22 hr 35 min 34.436 sec (GMT)

ENCOUNTER MINUS 54 hr 25 min 14.457 sec

S/C ALTITUDE 1,384,839 km, LONG. OF SUB-S/C POINT 48.67 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 37.9 km



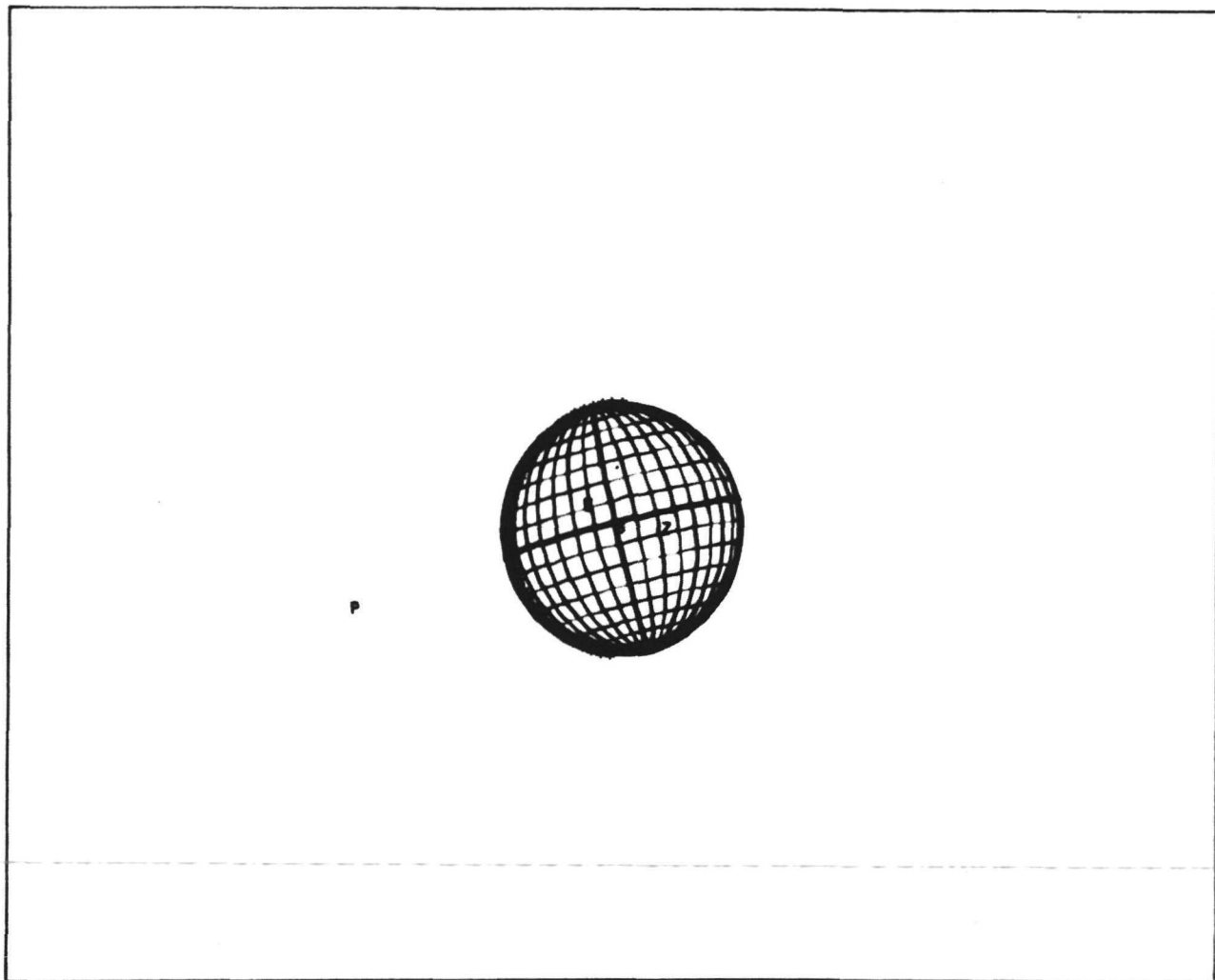
7 FE 31

SHUTTERED 2 AUG 23 hr 2 min 19,600 sec (GMT)

ENCOUNTER MINUS 53 hr 58 min 29.293 sec

S/C ALTITUDE 1,373,489 km, LONG. OF SUB-S/C POINT 42.16 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 37.6 km



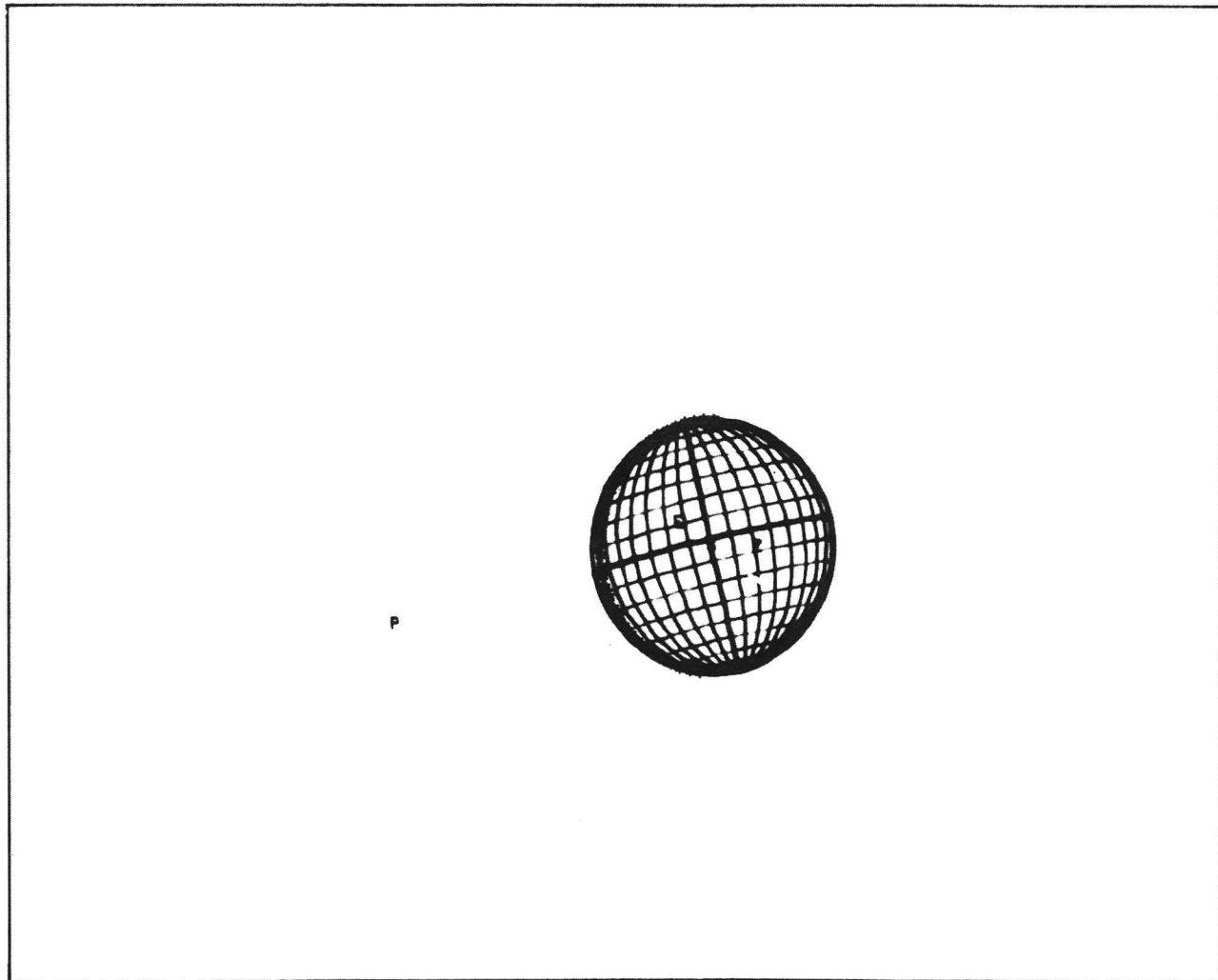
7 FE 32

SHUTTERED 2 AUG 23 hr 30 min 29.249 sec (GMT)

ENCOUNTER MINUS 53 hr 30 min 19.644 sec

S/C ALTITUDE 1,361,544 km, LONG. OF SUB-S/C POINT 35.19 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 37.3 km



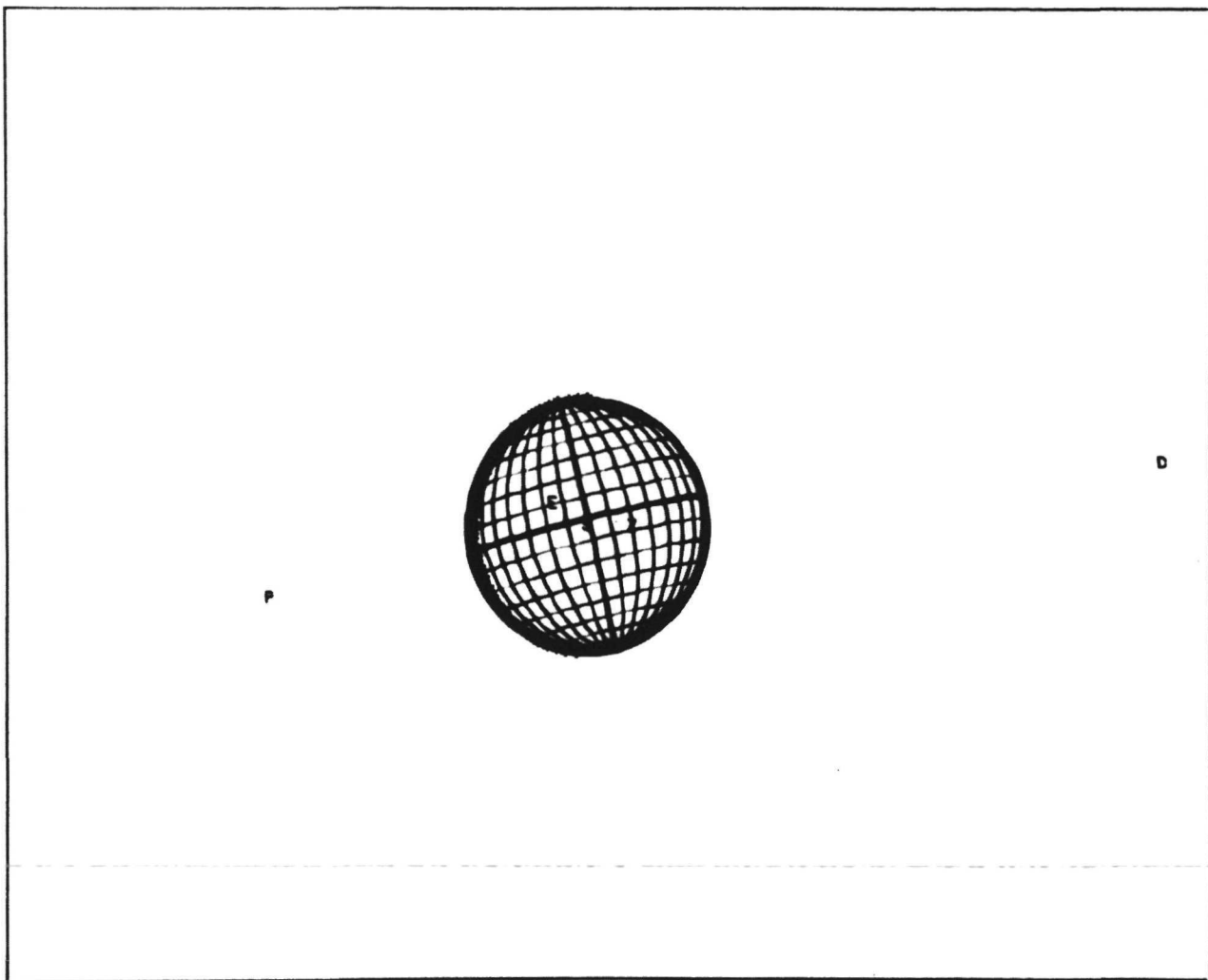
7 FE 33

SHUTTERED 2 AUG 23 hr 57 min 14.414 sec (GMT)

ENCOUNTER MINUS 53 hr 3 min 34.479 sec

S/C ALTITUDE 1,350,193 km, LONG. OF SUB-S/C POINT 28.68 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 37.0 km



7 FE 34

SHUTTERED 2 AUG 0 hr 23 min 59.578 sec (GMT)

ENCOUNTER MINUS 52 hr 37 min 49.315 sec

S/C ALTITUDE 1,338,843 km, LONG. OF SUB-S/C POINT 22.17 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 36.7 km

NOT SIMULATED

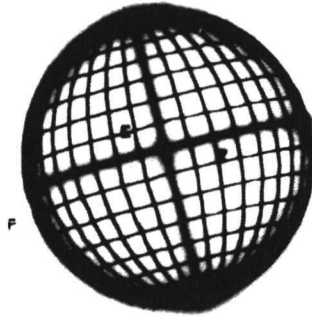
7 FE 35

SHUTTERED 3 AUG 6 hr 0 min 30.869 sec (GMT)

ENCOUNTER MINUS 46 hr 59 min 40.881 sec

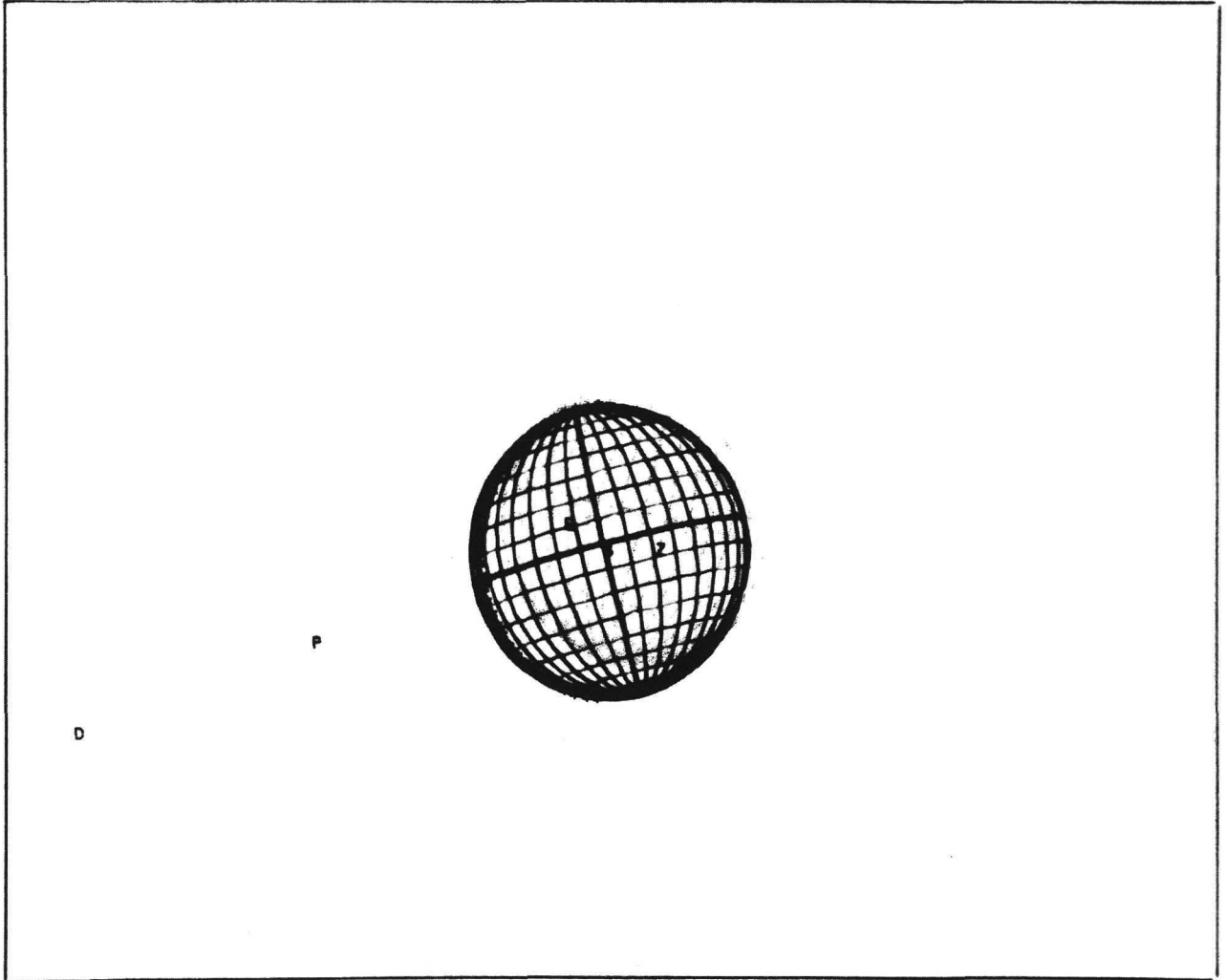
S/C ALTITUDE 1,196,080 km, LONG. OF SUB-S/C POINT 300.25 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 32.8 km



D

7 FE 36
SHUTTERED 3 AUG 6 hr 35 min 42.929 sec (GMT)
ENCOUNTER MINUS 46 hr 25 min 5.964 sec
S/C ALTITUDE 1,181,147 km, LONG. OF SUB-S/C POINT 291.68 deg EAST
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 32.4 km



7 FE 37

SHUTTERED 3 AUG 7 hr 12 min 19.473 sec (GMT)

ENCOUNTER MINUS 45 hr 48 min 29.420 sec

S/C ALTITUDE 1,165,616 km, LONG. OF SUB-S/C POINT 282.76 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 31.9 km



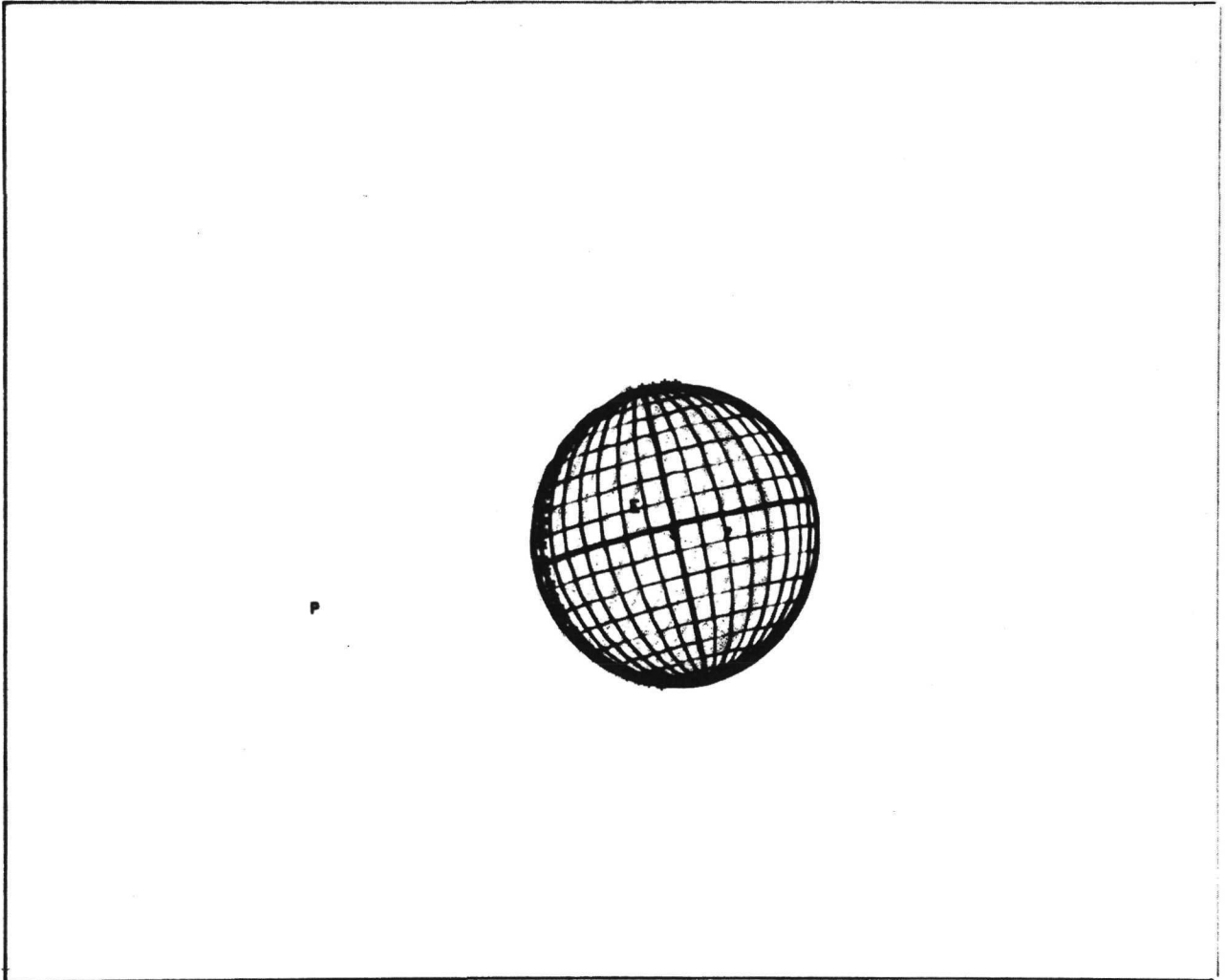
7 FE 38

SHUTTERED 3 AUG 7 hr 47 min 31.531 sec (GMT)

ENCOUNTER MINUS 45 hr 13 min 17.362 sec

S/C ALTITUDE 1,150,683 km, LONG. OF SUB-S/C POINT 274.20 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 31.5 km



7 FE 39

SHUTTERED 3 AUG 8 hr 24 min 8.075 sec (GMT)

ENCOUNTER MINUS 44 hr 36 min 40.818 sec

S/C ALTITUDE 1,135,152 km, LONG. OF SUB-S/C POINT 265.28 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 31.1 km



7 FE 40
SHUTTERED 3 AUG 8 hr 59 min 20.133 sec (GMT)
ENCOUNTER MINUS 44 hr 1 min 28.760 sec
S/C ALTITUDE 1,120,219 km, LONG. OF SUB-S/C POINT 256.71 deg EAST
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 30.7 km



7 FE 41

SHUTTERED 3 AUG 9 hr 35 min 56.675 sec (GMT)

ENCOUNTER MINUS 43 hr 25 min 52.218 sec

S/C ALTITUDE 1,104,688 km, LONG. OF SUB-S/C POINT 247.80 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 30.3 km



7 FE 42

SHUTTERED 3 AUG 10 hr 12 min 33.217 sec (GMT)

ENCOUNTER MINUS 42 hr 48 min 15.676 sec

S/C ALTITUDE 1,089,157 km, LONG. OF SUB-S/C POINT 238.78 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 29.9 km



7 FE 43

SHUTTERED 3 AUG 10 hr 47 min 45.277 sec (GMT)

ENCOUNTER MINUS 42 hr 13 min 3.616 sec

S/C ALTITUDE 1,074,223 km, LONG. OF SUB-S/C POINT 230.21 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 29.5 km



P

7 FE 44

SHUTTERED 3 AUG 11 hr 24 min 21.821 sec (GMT)

ENCOUNTER MINUS 41 hr 36 min 27.072 sec

S/C ALTITUDE 1,058,692 km, LONG. OF SUB-S/C POINT 221.29 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 29.0 km



7 FE 45

SHUTTERED 3 AUG 11 hr 59 min 33.879 sec (GMT)

ENCOUNTER MINUS 41 hr 1 min 15.014 sec

S/C ALTITUDE 1,043,759 km, LONG. OF SUB-S/C POINT 212.72 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 28.6 km



7 FE 46

SHUTTERED 3 AUG 12 hr 36 min 10.423 sec (GMT)

ENCOUNTER MINUS 40 hr 24 min 38.470 sec

S/C ALTITUDE 1,028,228 km, LONG. OF SUB-S/C POINT 203.81 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 28.2 km



7 FE 47

SHUTTERED 3 AUG 13 hr 11 min 22.483 sec (GMT)

ENCOUNTER MINUS 39 hr 49 min 26.410 sec

S/C ALTITUDE 1,013,294 km, LONG. OF SUB-S/C POINT 195.24 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 27.8 km



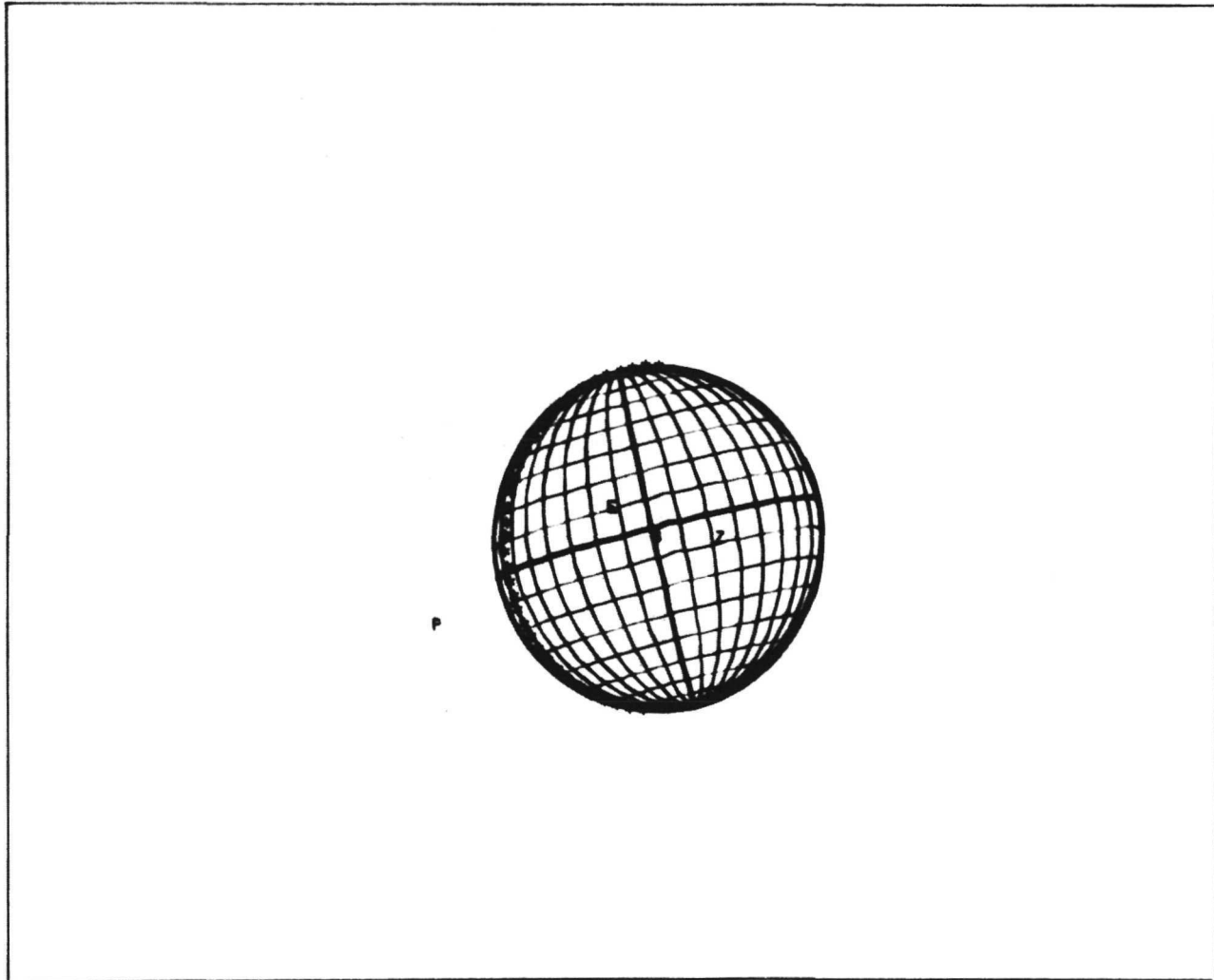
7 FE 48

SHUTTERED 3 AUG 13 hr 47 min 59.023 sec (GMT)

ENCOUNTER MINUS 39 hr 12 min 49.870 sec

S/C ALTITUDE 997,763 km, LONG. OF SUB-S/C POINT 186.33 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 27.3 km



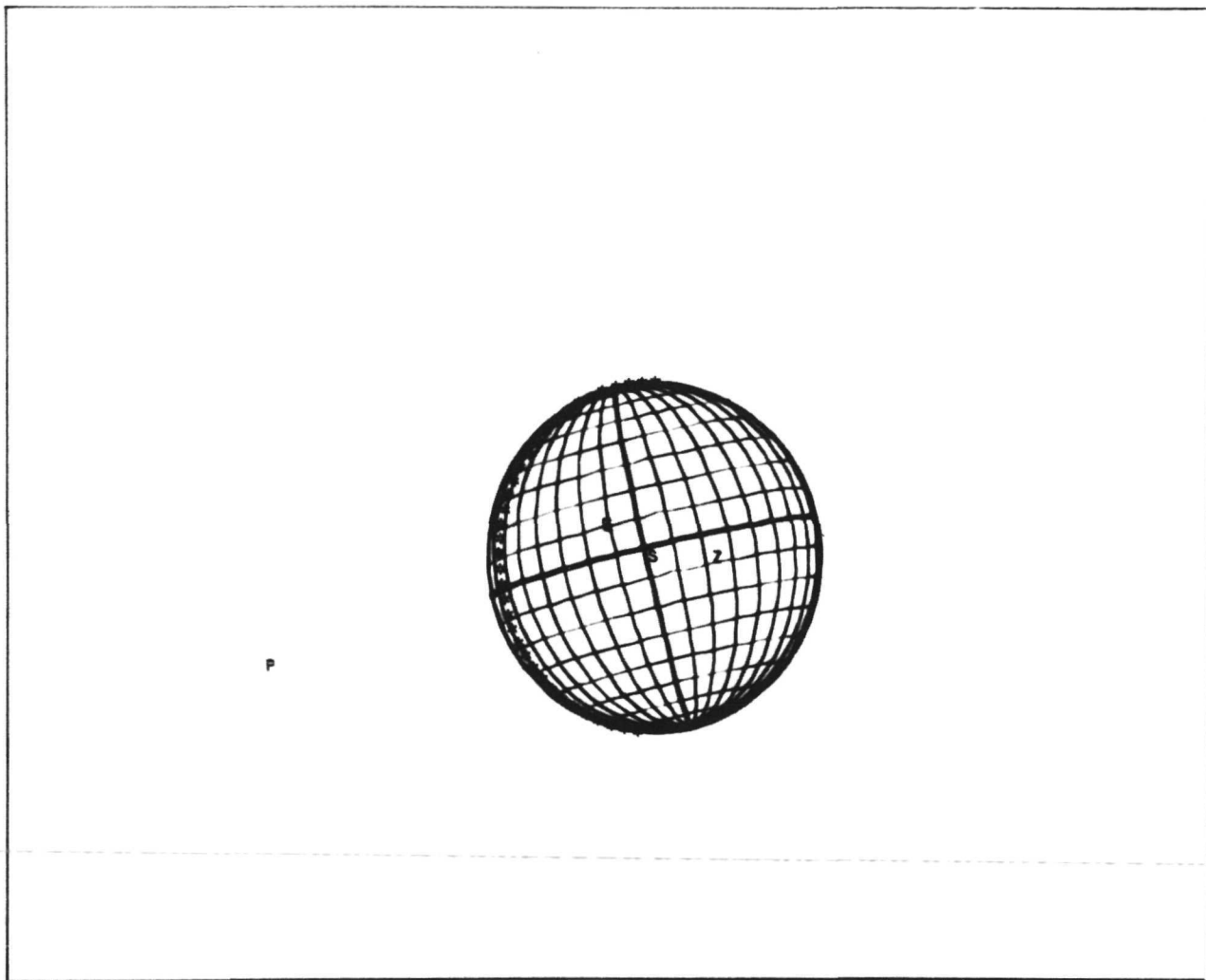
7 FE 49

SHUTTERED 3 AUG 14 hr 24 min 35.568 sec (GMT)

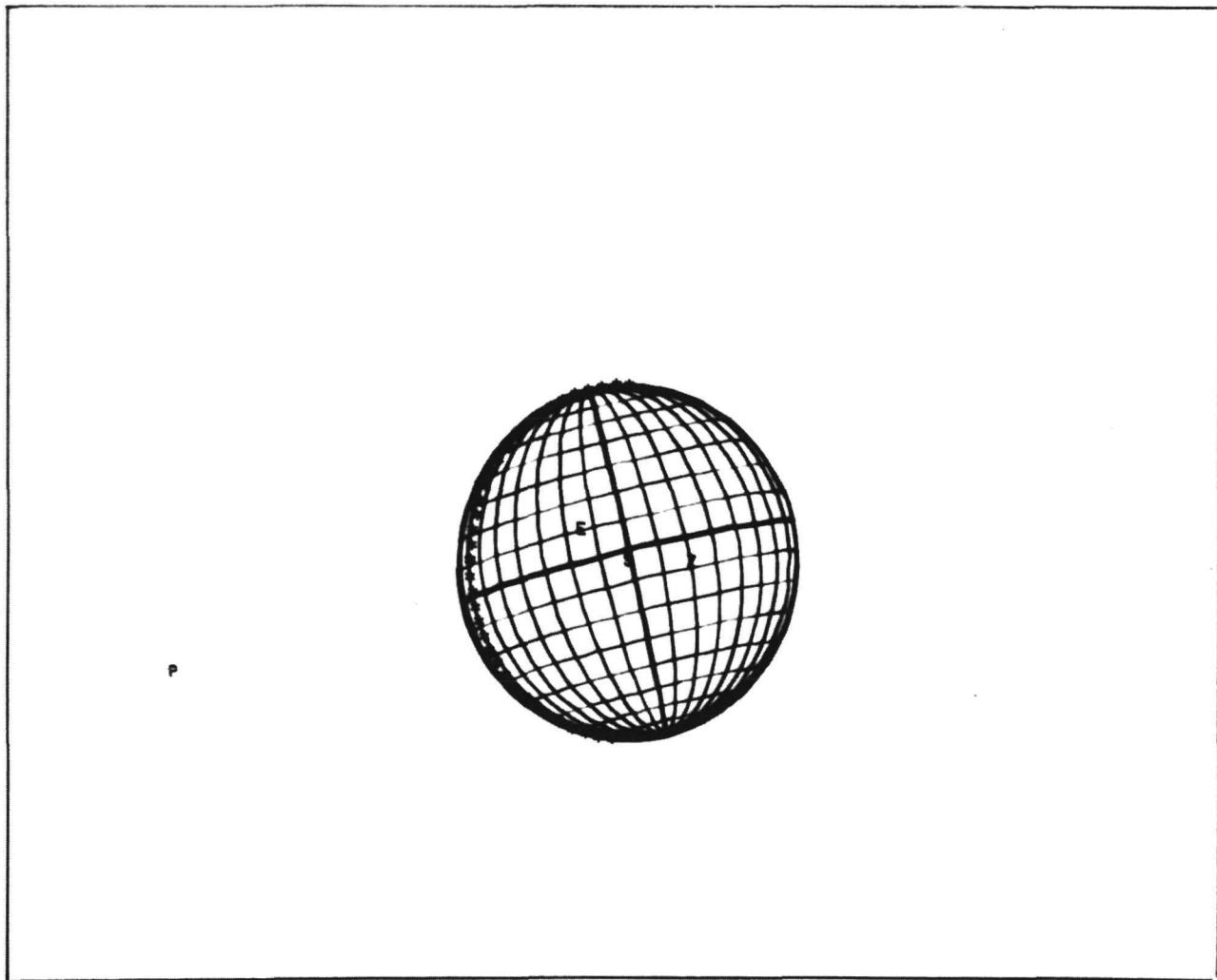
ENCOUNTER MINUS 38 hr 36 min 13.325 sec

S/C ALTITUDE 982,232 km, LONG. OF SUB-S/C POINT 177.42 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 26.9 km



7 FE 50
SHUTTERED 3 AUG 14 hr 59 min 47.627 sec (GMT)
ENCOUNTER MINUS 38 hr 1 min 1.266 sec
S/C ALTITUDE 967,297 km, LONG. OF SUB-S/C POINT 168.85 deg EAST
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 26.5 km



7 FE 51

SHUTTERED 3 AUG 15 hr 36 min 24.168 sec (GMT)

ENCOUNTER MINUS 37 hr 24 min 24.725 sec

S/C ALTITUDE 951,766 km, LONG. OF SUB-S/C POINT 159.93 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 26.1 km



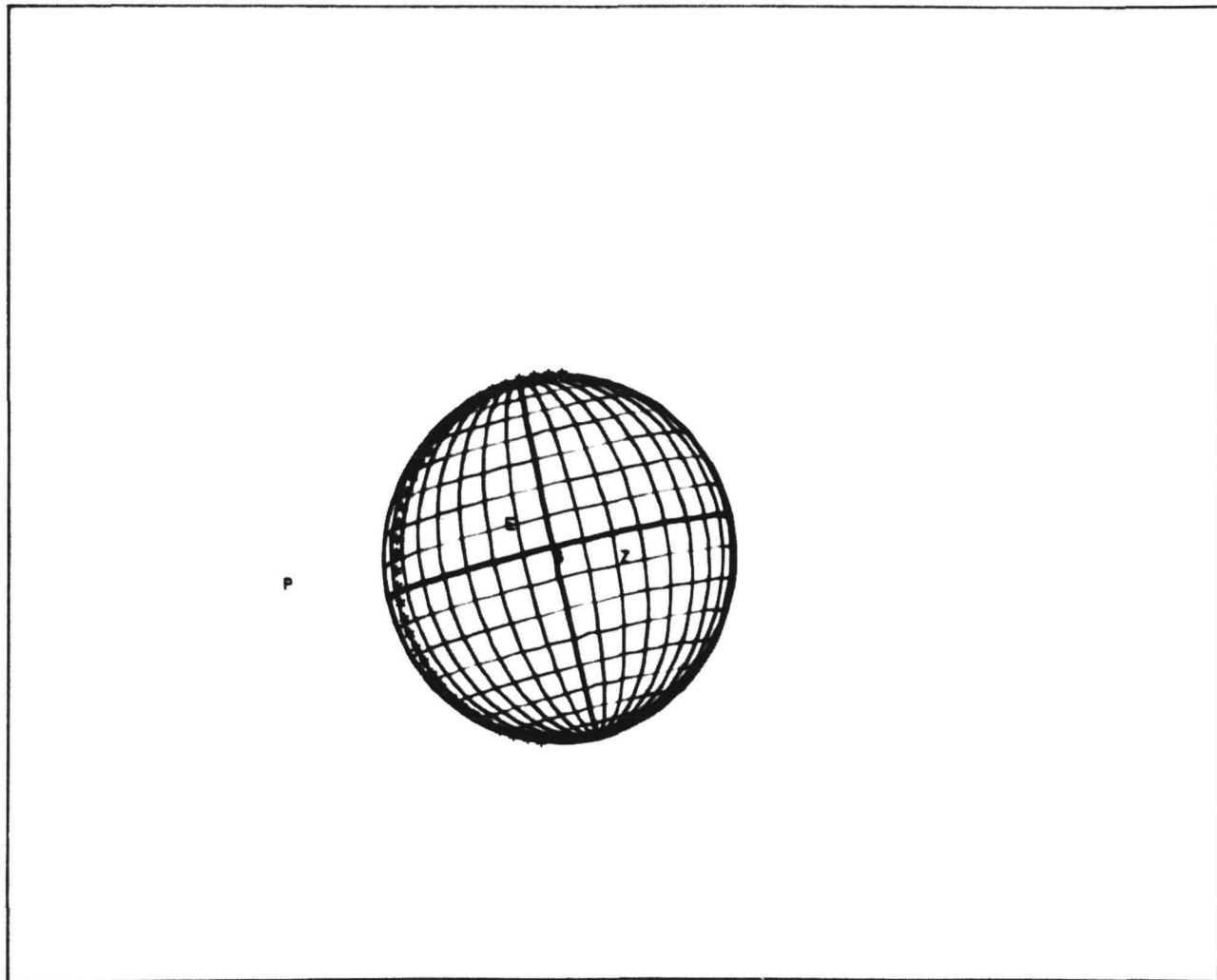
7 FE 52

SHUTTERED 3 AUG 16 hr 11 min 36.227 sec (GMT)

ENCOUNTER MINUS 36 hr 49 min 12.666 sec

S/C ALTITUDE 936,832 km, LONG. OF SUB-S/C POINT 151.36 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 25.7 km



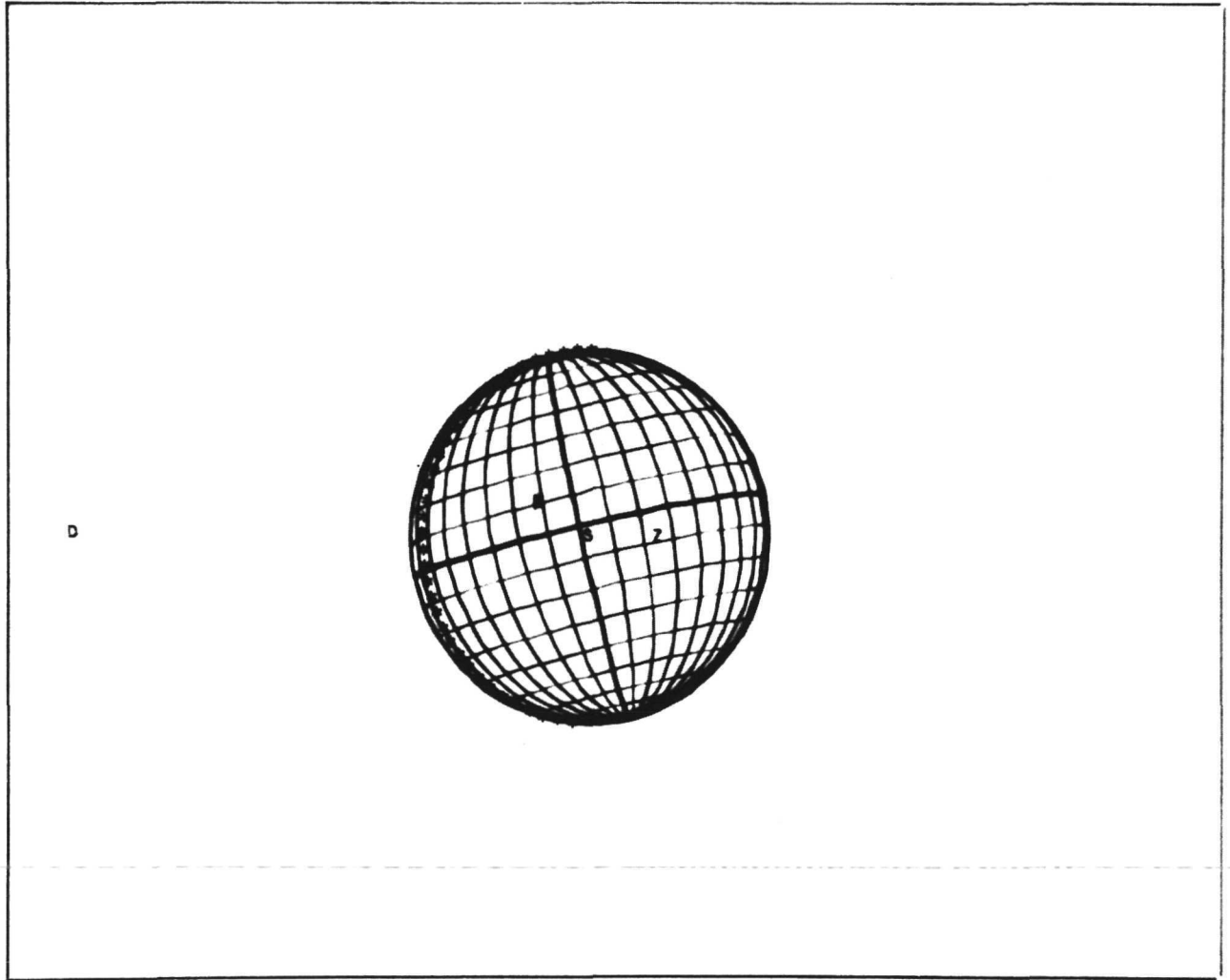
7 FE 53

SHUTTERED 3 AUG 16 hr 48 min 12.770 sec (GMT)

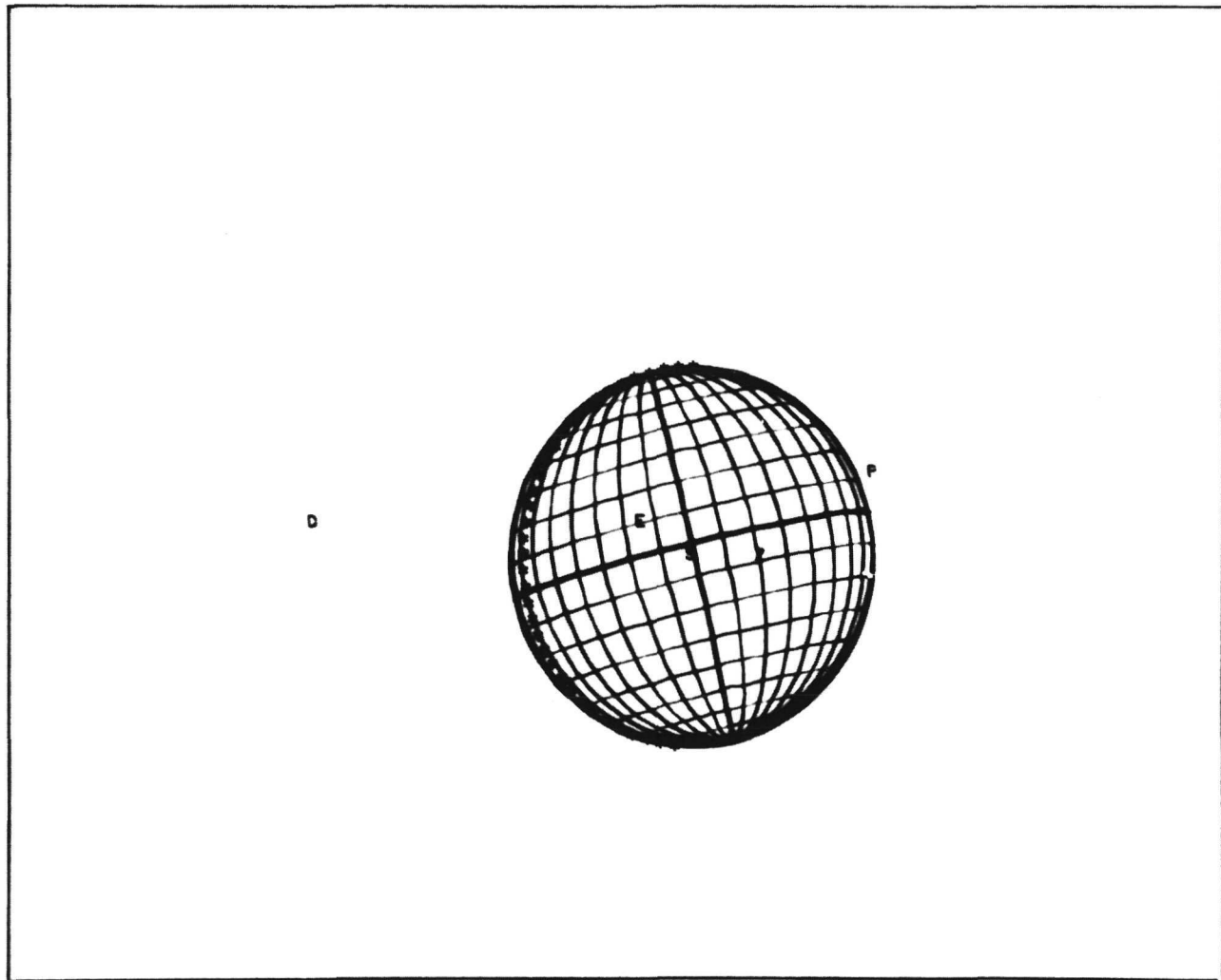
ENCOUNTER MINUS 36 hr 12 min 36.123 sec

S/C ALTITUDE 921,300 km, LONG. OF SUB-S/C POINT 142.45 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 25.3 km



7 FE 54
SHUTTERED 3 AUG 17 hr 23 min 24.830 sec (GMT)
ENCOUNTER MINUS 35 hr 37 min 24.063 sec
S/C ALTITUDE 906,365 km, LONG. OF SUB-S/C POINT 133.88 deg EAST
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 24.8 km



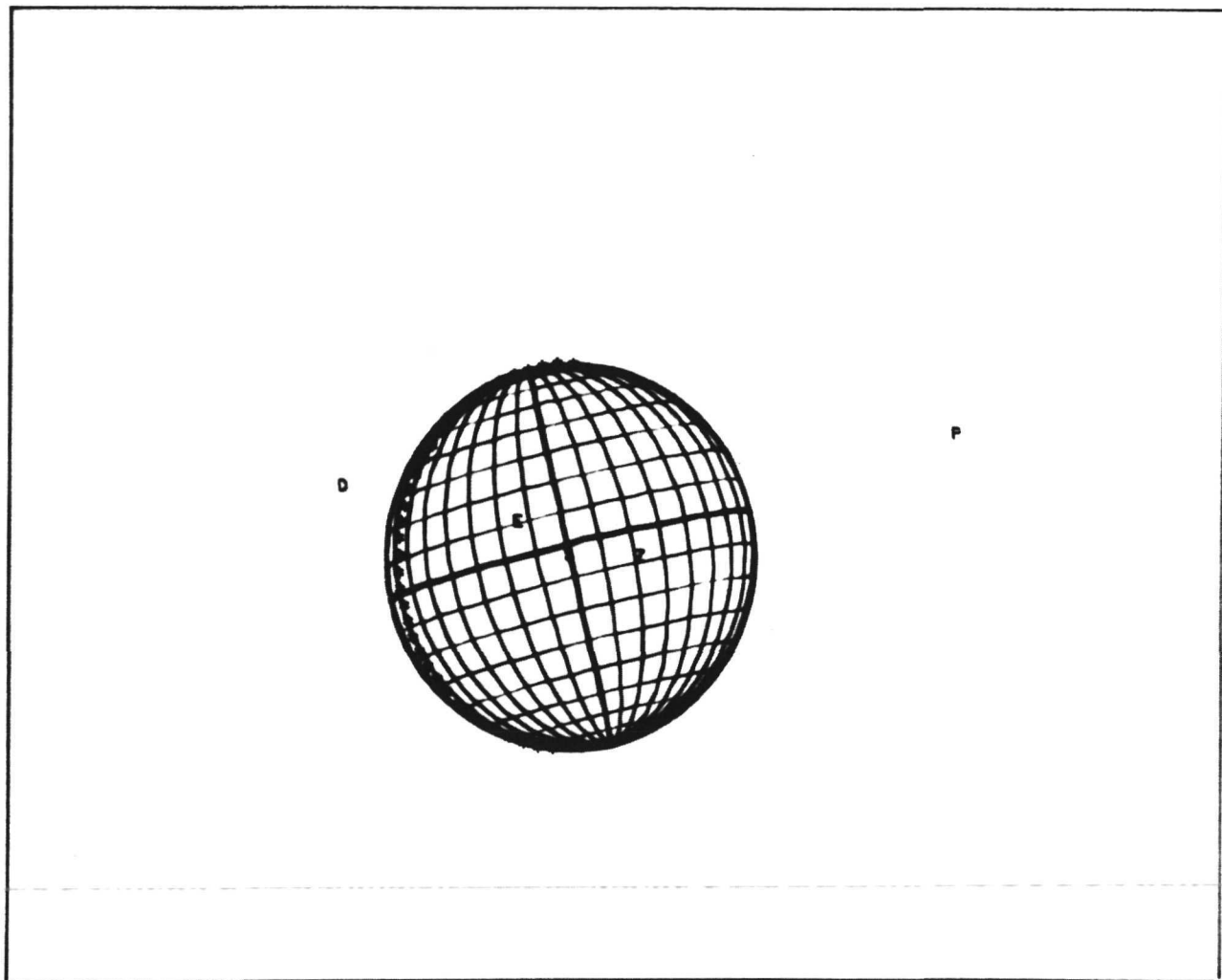
7 FE 55

SHUTTERED 3 AUG 18 hr 0 min 1.373 sec (GMT)

ENCOUNTER MINUS 35 hr 0 min 47.520 sec

S/C ALTITUDE 890,834 km, LONG. OF SUB-S/C POINT 124.97 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 24.4 km



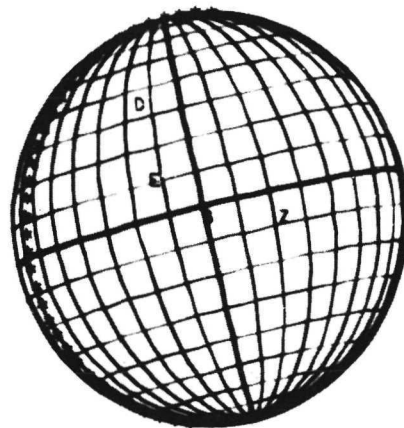
7 FE 56

SHUTTERED 3 AUG 18 hr 36 min 37.915 sec (GMT)

ENCOUNTER MINUS 34 hr 24 min 10.978 sec

S/C ALTITUDE 875,301 km, LONG. OF SUB-S/C POINT 116.05 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 24.0 km



7 FE 57

SHUTTERED 3 AUG 19 hr 11 min 49.975 sec (GMT)

ENCOUNTER MINUS 33 hr 48 min 58.918 sec

S/C ALTITUDE 860,366 km, LONG. OF SUB-S/C POINT 107.49 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 23.6 km



P

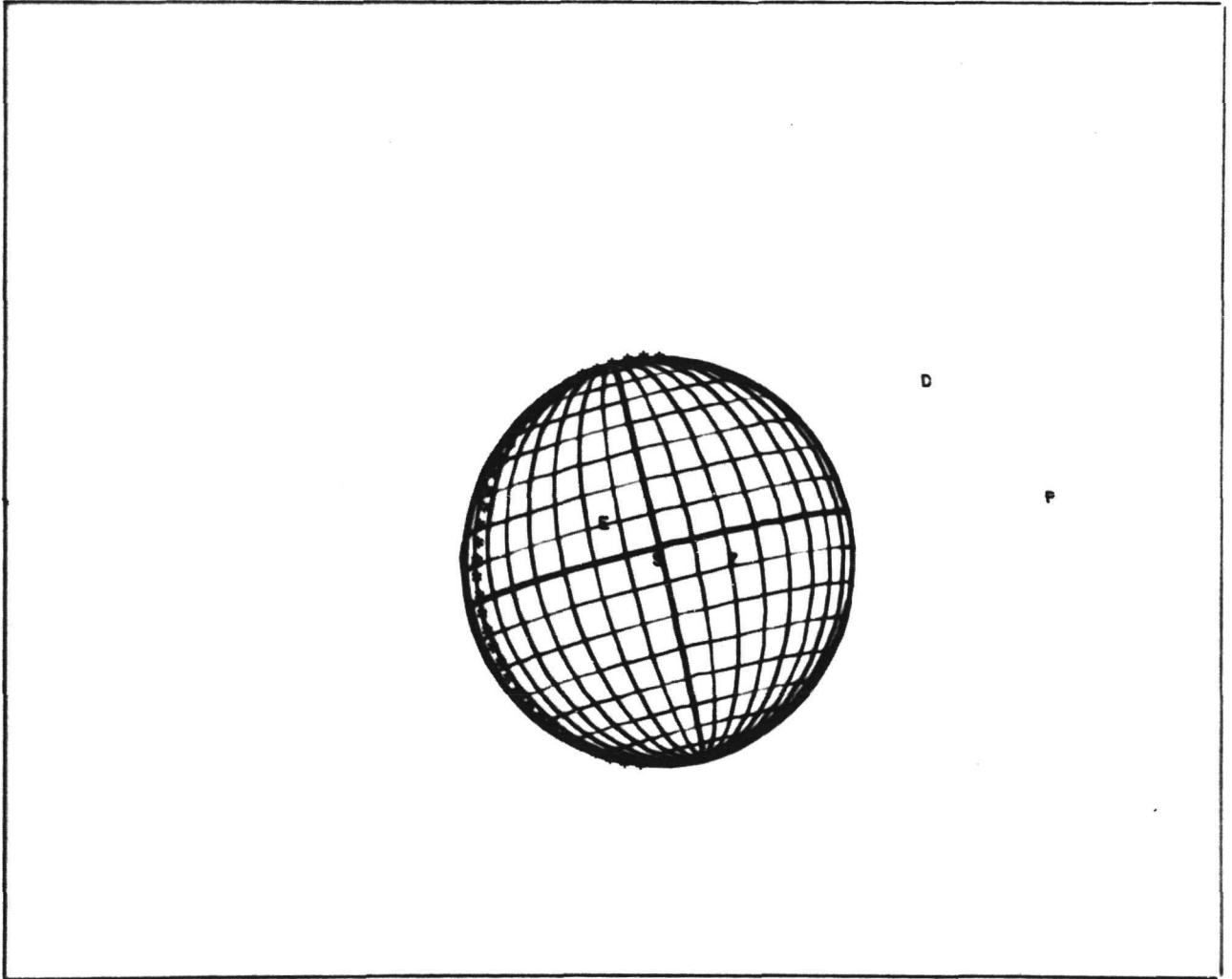
7 FE 58

SHUTTERED 3 AUG 19 hr 48 min 26.516 sec (GMT)

ENCOUNTER MINUS 33 hr 12 min 22.377 sec

S/C ALTITUDE 844,834 km, LONG. OF SUB-S/C POINT 98.57 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 23.2 km



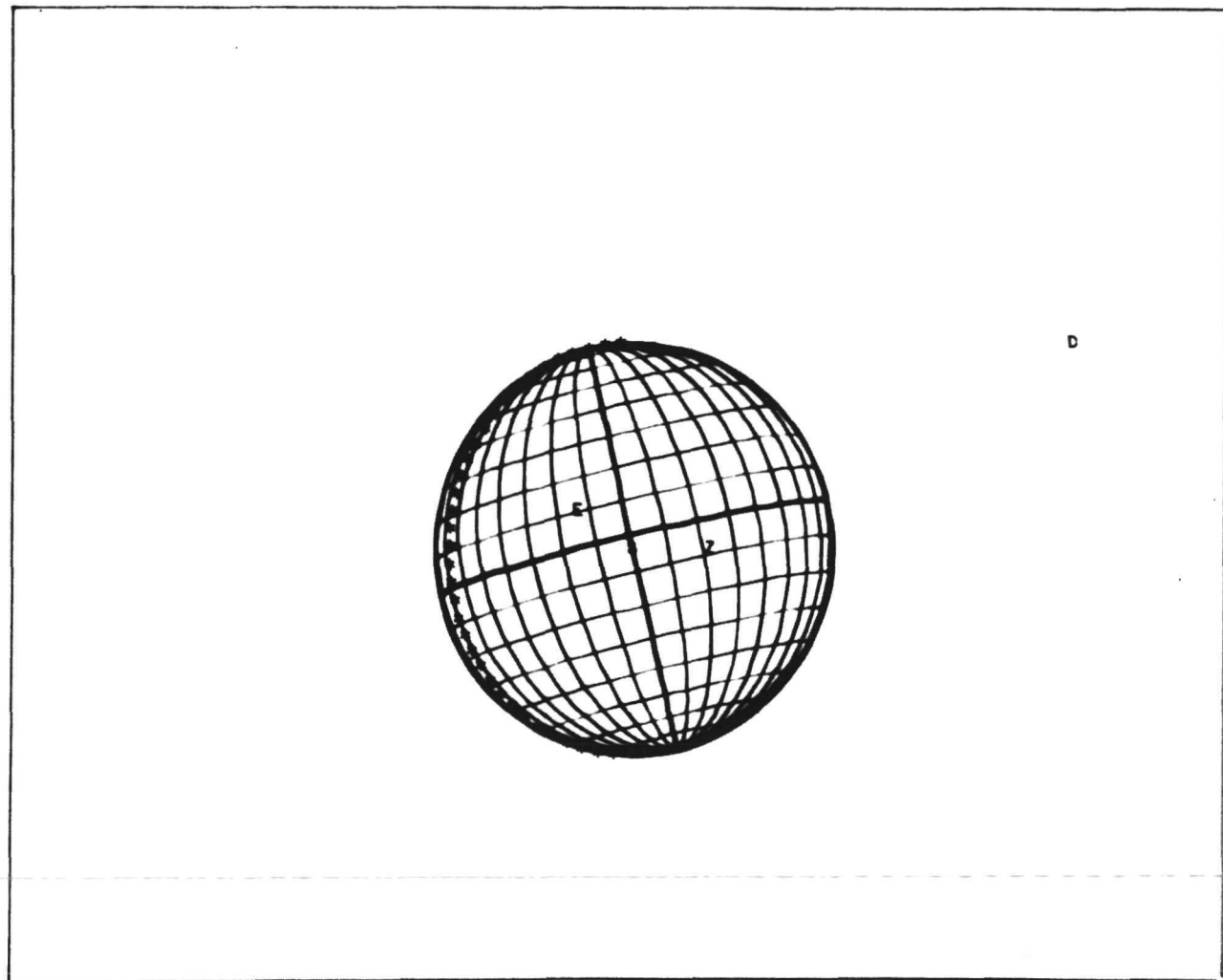
7 FE 59

SHUTTERED 3 AUG 20 hr 23 min 38.576 sec (GMT)

ENCOUNTER MINUS 32 hr 37 min 10.317 sec

S/C ALTITUDE 829,899 km, LONG. OF SUB-S/C POINT 90.00 deg EAST

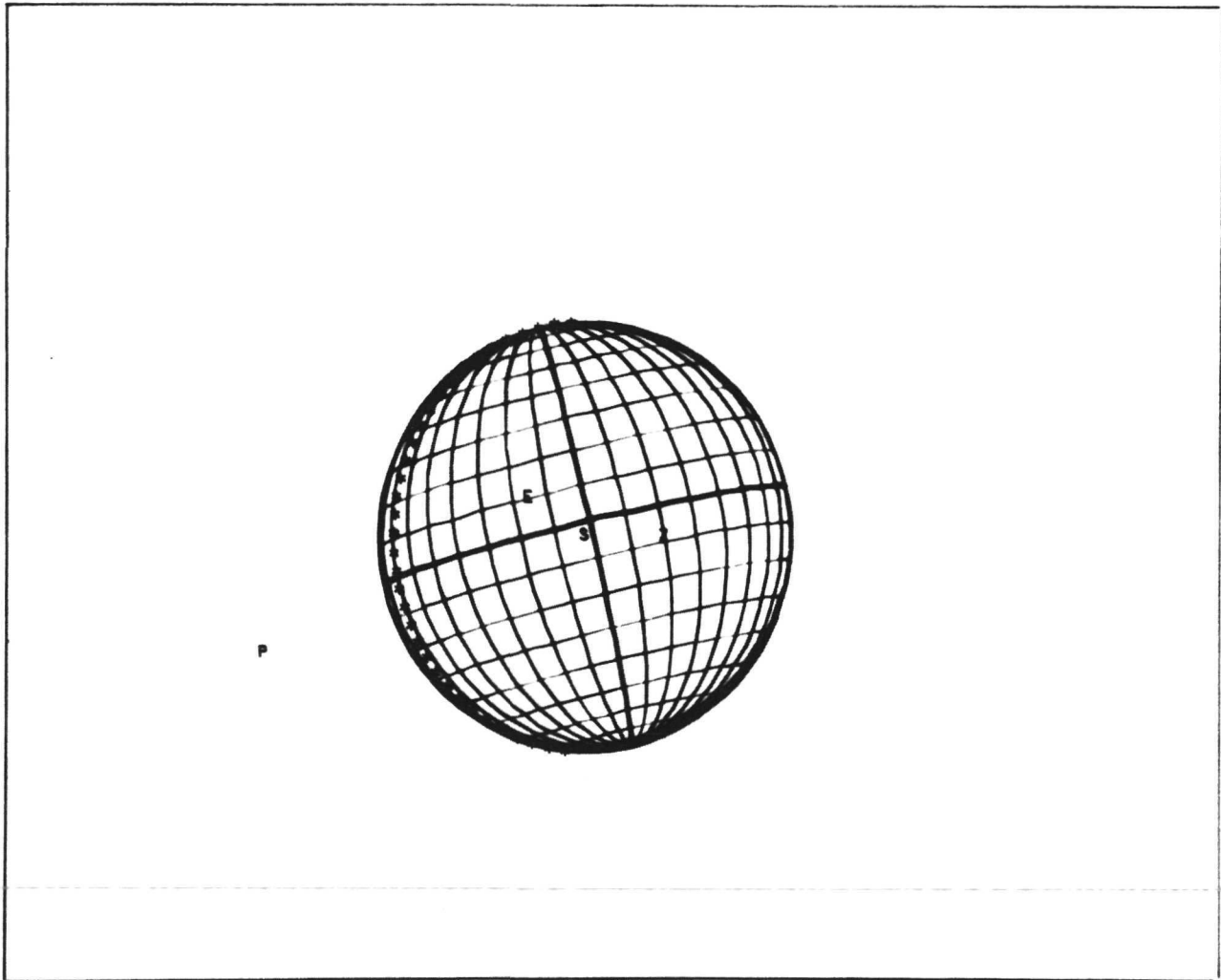
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 22.8 km



7 FE 60
SHUTTERED 3 AUG 21 hr 0 min 15.118 sec (GMT)
ENCOUNTER MINUS 32 hr 0 min 33.775 sec
S/C ALTITUDE 814,367 km, LONG. OF SUB-S/C POINT 81.09 deg EAST
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 22.4 km



7 FE 61
SHUTTERED 3 AUG 21 hr 34 min 27.178 sec (GMT)
ENCOUNTER MINUS 31 hr 26 min 21.715 sec
S/C ALTITUDE 799,855 km, LONG. OF SUB-S/C POINT 72.77 deg EAST
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 22.0 km



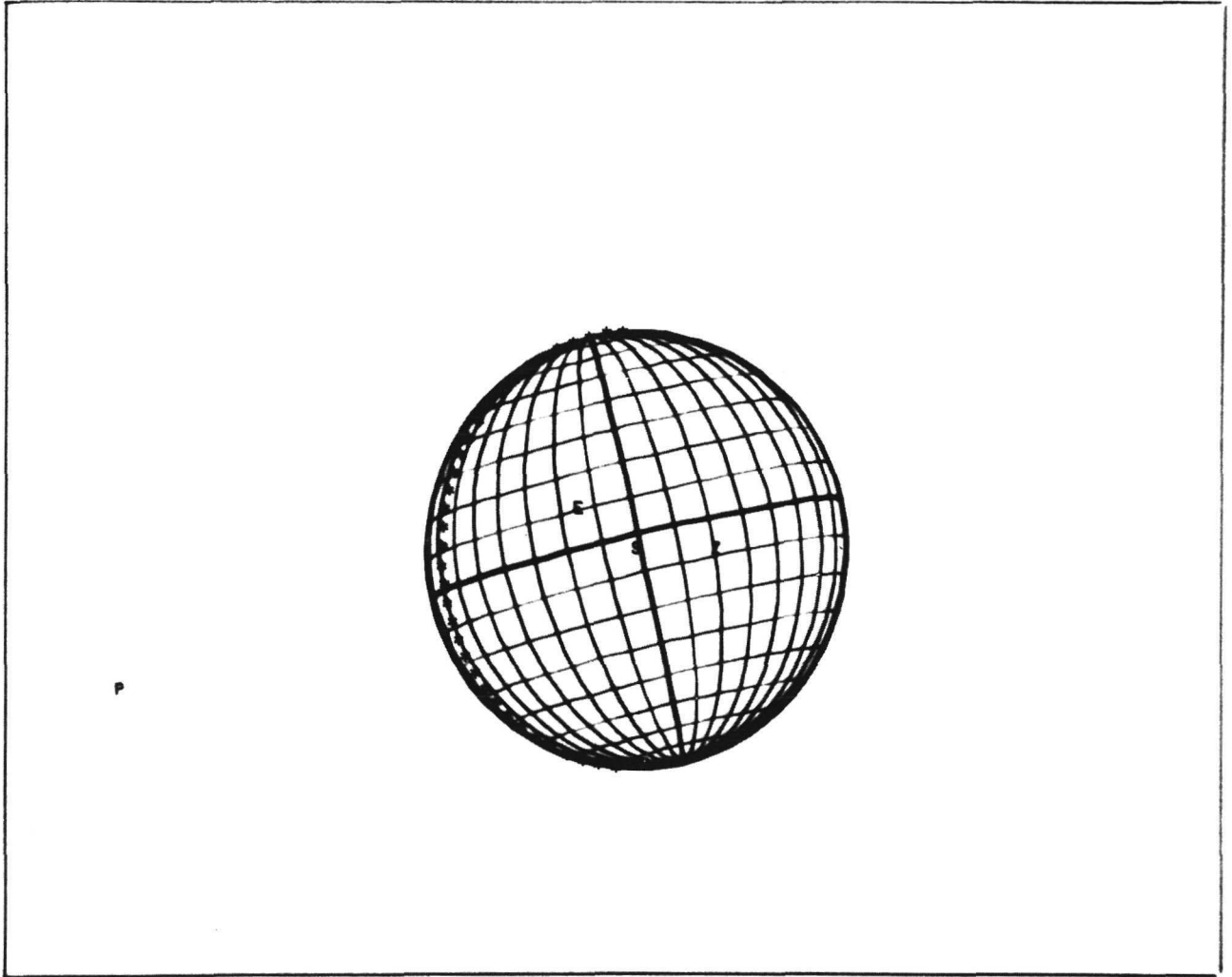
7 FE 62

SHUTTERED 3 AUG 22 hr 12 min 3.720 sec (GMT)

ENCOUNTER MINUS 30 hr 48 min 45.173 sec

S/C ALTITUDE 783,898 km, LONG. OF SUB-S/C POINT 63.61 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 21.5 km



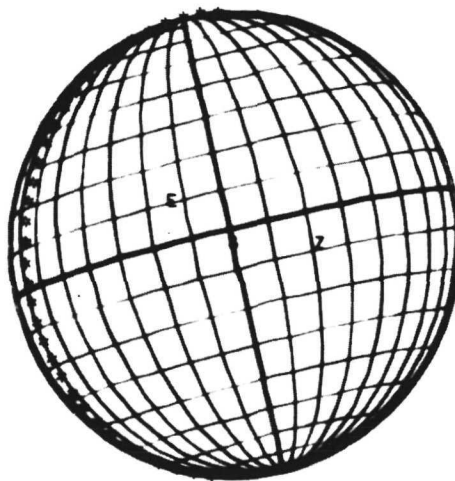
7 FE 63

SHUTTERED 3 AUG 22 hr 47 min 15.779 sec (GMT)

ENCOUNTER MINUS 30 hr 13 min 33.114 sec

S/C ALTITUDE 768,961 km, LONG. OF SUB-S/C POINT 55.04 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 21.1 km



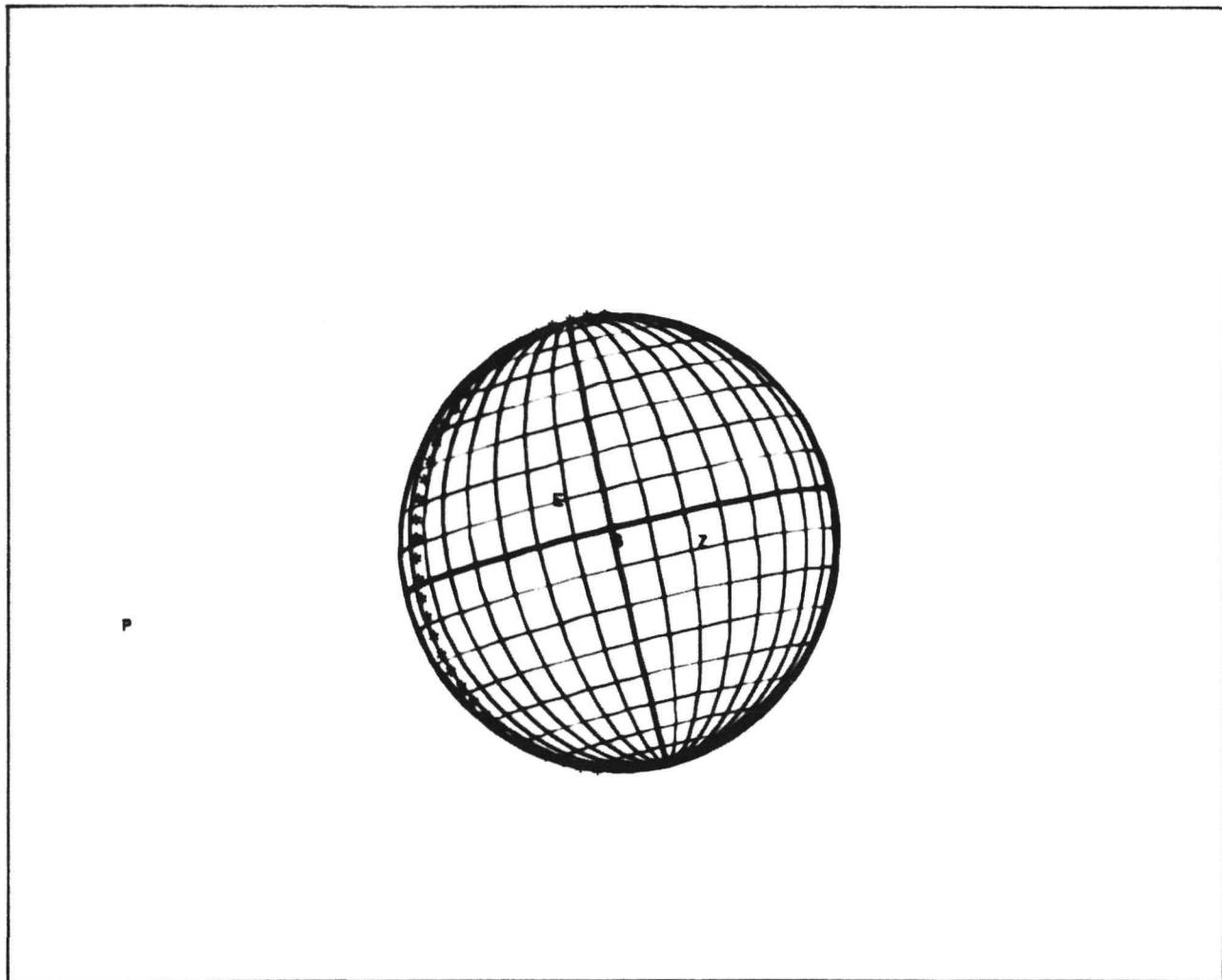
7 FE 64

SHUTTERED 3 AUG 23 hr 23 min 52.323 sec (GMT)

ENCOUNTER MINUS 29 hr 36 min 56.57 sec

S/C ALTITUDE 753,428 km, LONG. OF SUB-S/C POINT 46.13 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 20.7 km



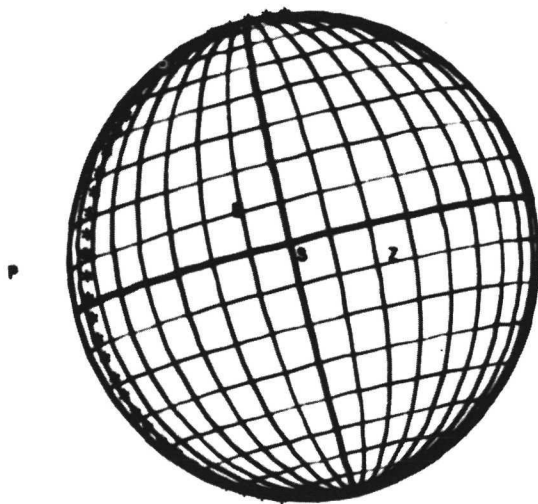
7 FE 65

SHUTTERED 4 AUG 0 hr 0 min 28.864 sec (GMT)

ENCOUNTER MINUS 29 hr 0 min 20.029 sec

S/C ALTITUDE 737,894 km, LONG. OF SUB-S/C POINT 37.22 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 20.3 km



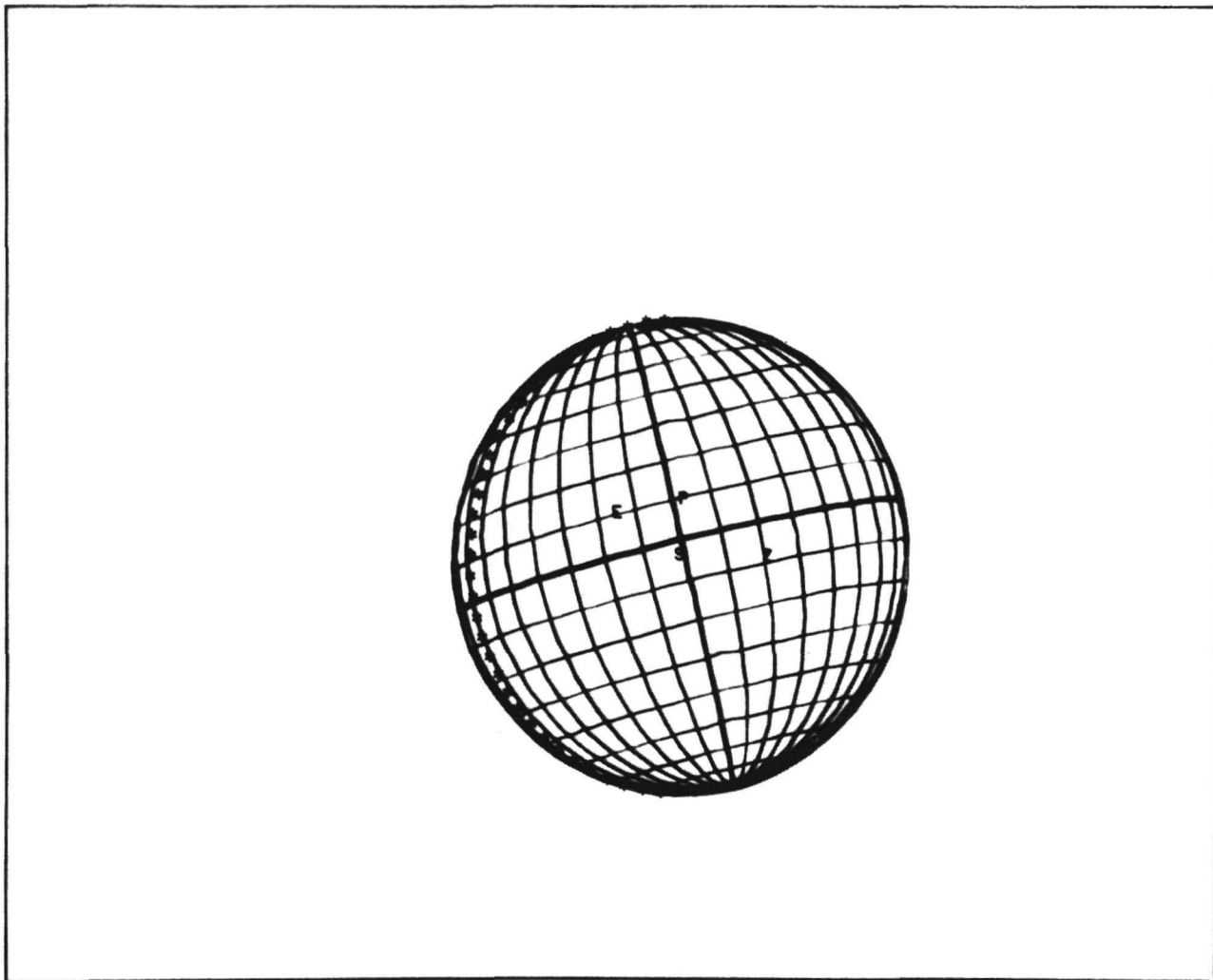
7 FE 66

SHUTTERED 4 AUG 0 hr 35 min 40.924 sec (GMT)

ENCOUNTER MINUS 28 hr 25 min 7.969 sec

S/C ALTITUDE 722.957 km, LONG OF SUB-S/C POINT 28.65 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 19.9 km



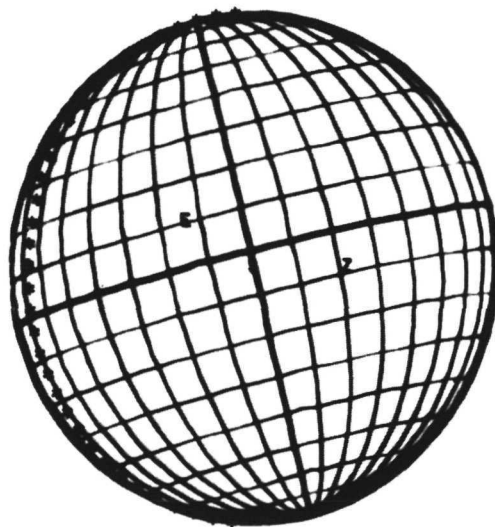
7 FE 67

SHUTTERED 4 AUG 1 hr 12 min 17.467 sec (GMT)

ENCOUNTER MINUS 27 hr 48 min 31.426 sec

S/C ALTITUDE 707,423 km, LONG. OF SUB-S/C POINT 19.74 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 19.4 km



7 FE 68

SHUTTERED 4 AUG 1 hr 47 min 29.527 sec (GMT)

ENCOUNTER MINUS 27 hr 13 min 19.366 sec

S/C ALTITUDE 692,486 km, LONG. OF SUB-S/C POINT 11.17 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 19.0 km

NOT SIMULATED

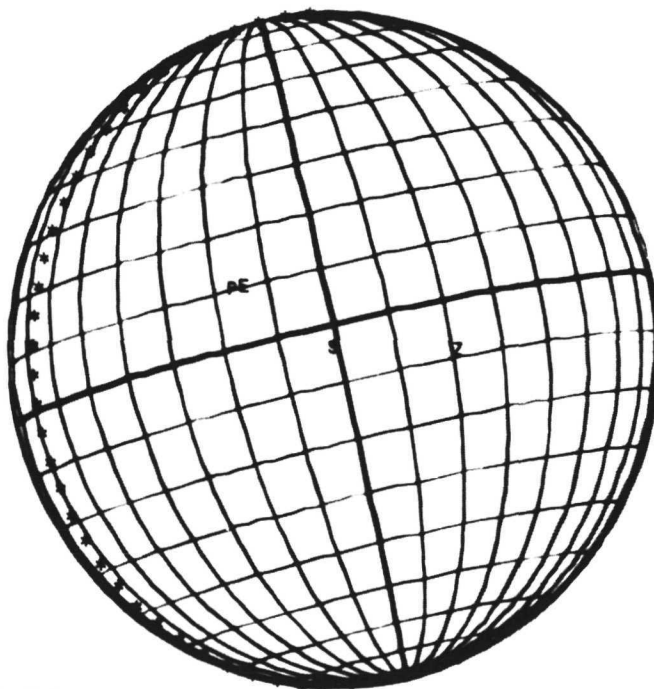
7 FE 69

SHUTTERED 4 AUG 8 hr 6 min 15.290 sec (GMT)

ENCOUNTER MINUS 20 hr 54 min 33.603 sec

S/C ALTITUDE 531,739 km, LONG. OF SUB-S/C POINT 279.00 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 14.6 km



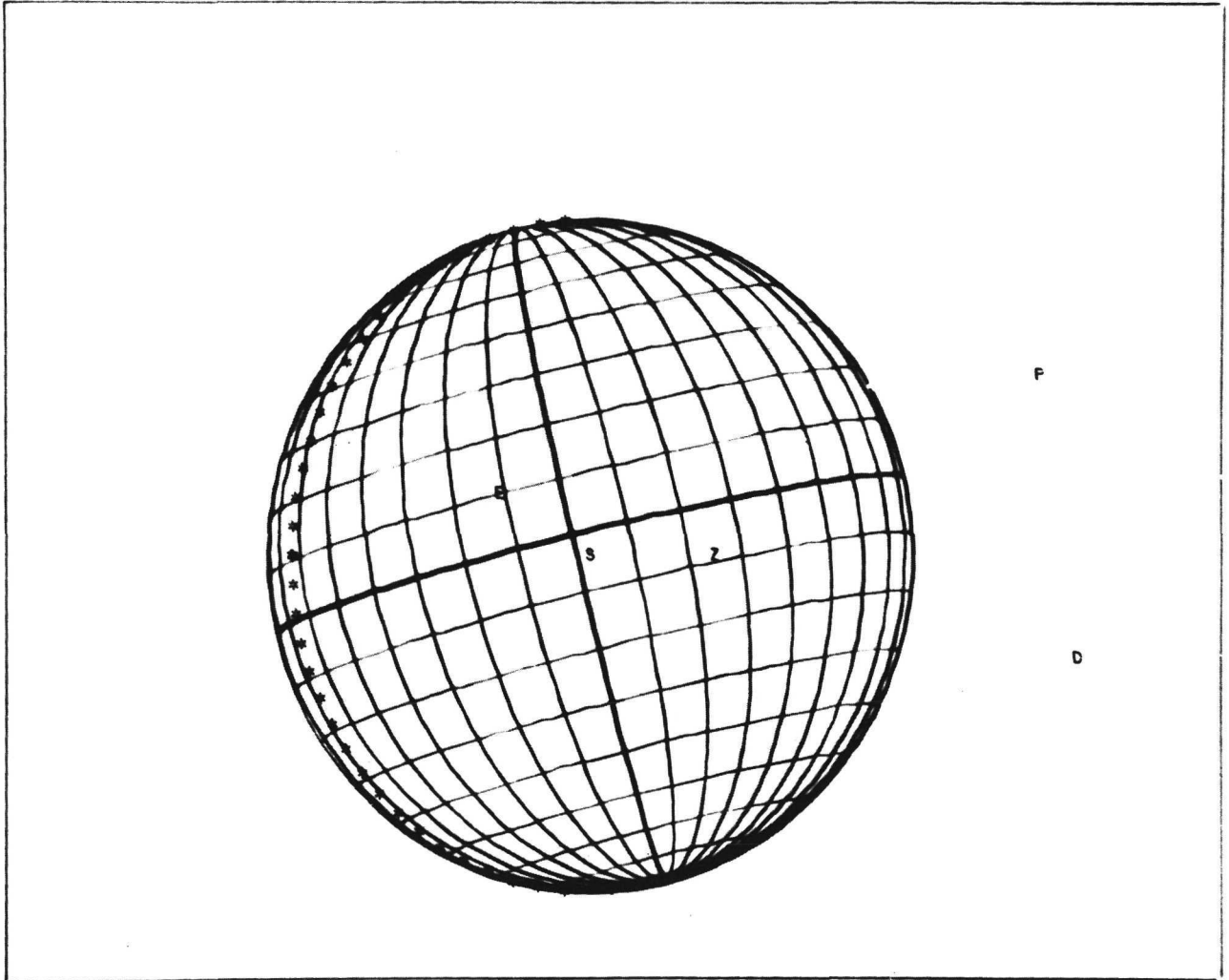
7 FE 70

SHUTTERED 4 AUG 8 hr 54 min 7.692 sec (GMT)

ENCOUNTER MINUS 20 hr 6 min 41.201 sec

S/C ALTITUDE 511,418 km, LONG. OF SUB-S/C POINT 267.35 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 14.0 km



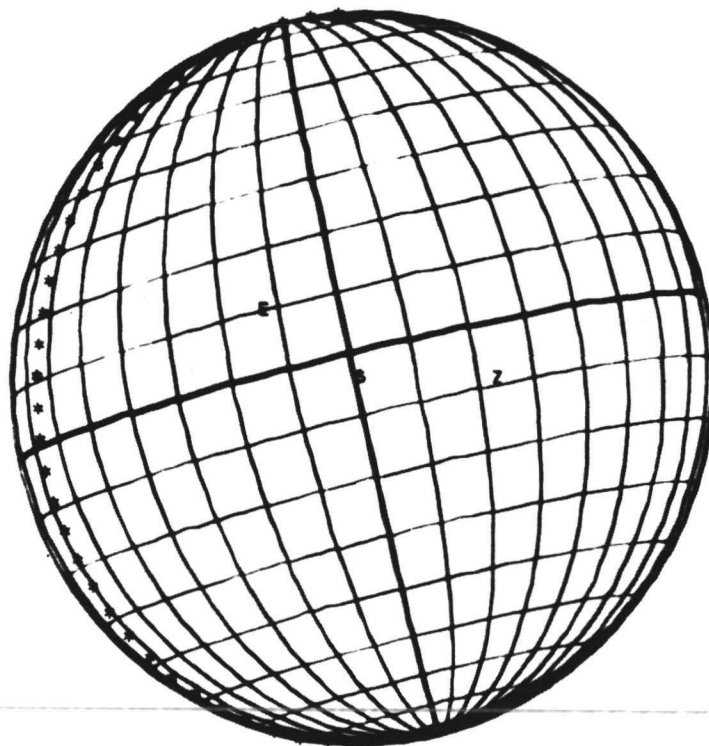
7 FE 71

SHUTTERED 4 AUG 9 hr 40 min 35.611 sec (GMT)

ENCOUNTER MINUS 19 hr 20 min 13.282 sec

S/C ALTITUDE 491,694 km, LONG. OF SUB-S/C POINT 256.05 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 13.5 km



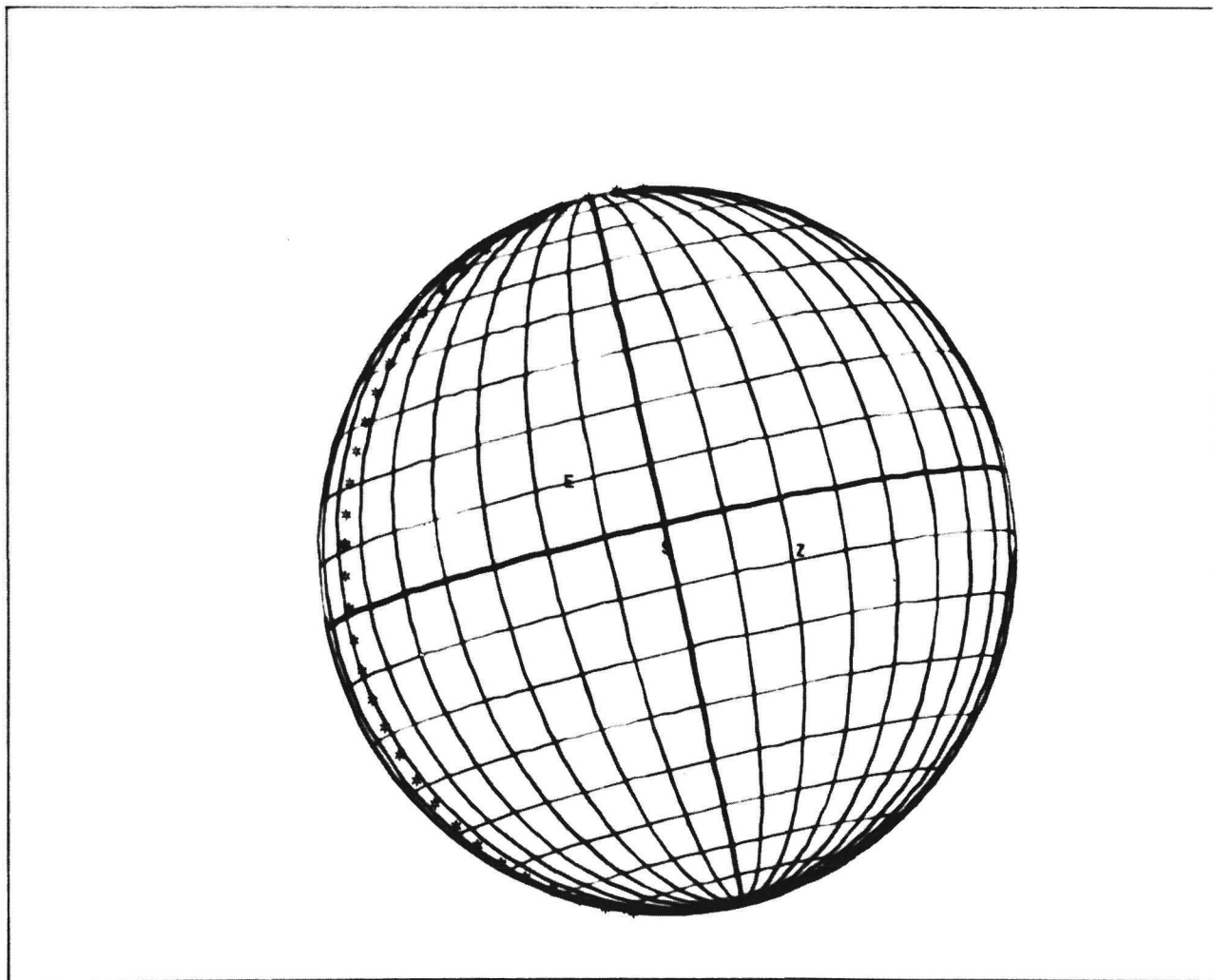
7 FE 72

SHUTTERED 4 AUG 10 hr 28 min 28.011 sec (GMT)

ENCOUNTER MINUS 18 hr 32 min 20.882 sec

S/C ALTITUDE 471,370 km, LONG. OF SUB-S/C POINT 244.41 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 12.9 km



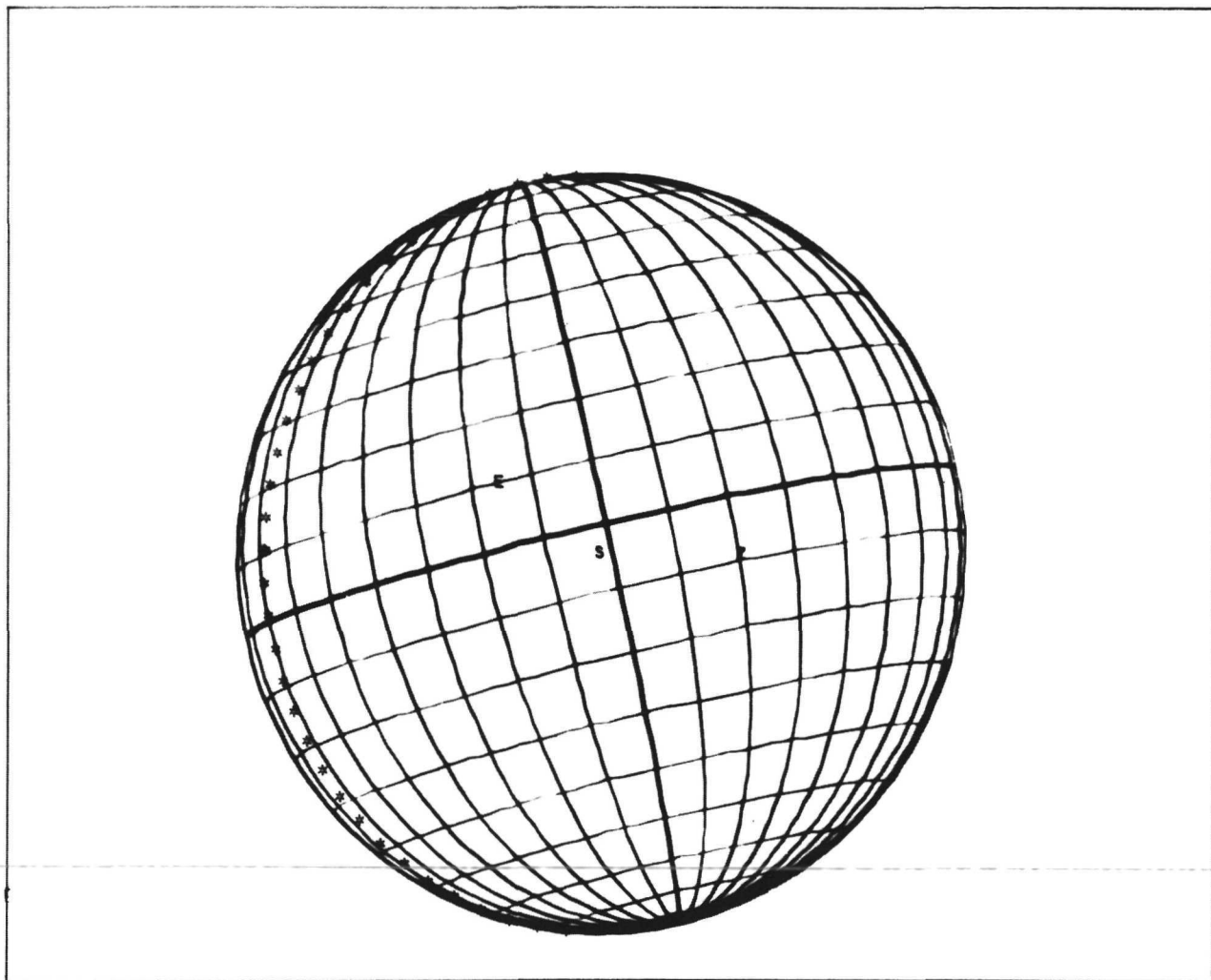
7 FE 73

SHUTTERED 4 AUG 11 hr 14 min 55.930 sec (GMT)

ENCOUNTER MINUS 17 hr 45 min 52.963 sec

S/C ALTITUDE 451,644 km, LONG. OF SUB-S/C POINT 233.11 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 12.4 km



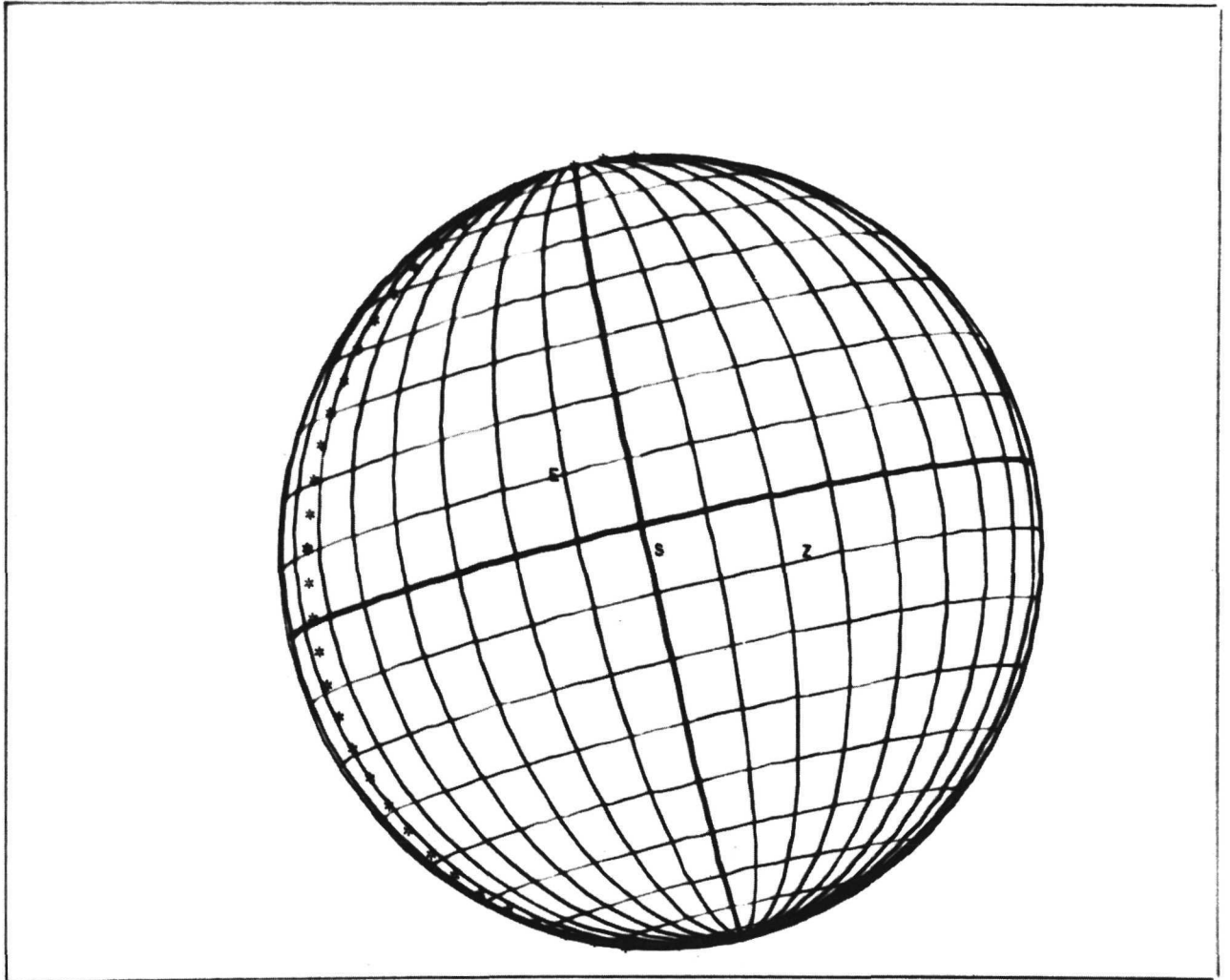
7 FE 74

SHUTTERED 4 AUG 12 hr 1 min 23.849 sec (GMT)

ENCOUNTER MINUS 16 hr 59 min 25.044 sec

S/C ALTITUDE 431,916 km, LONG. OF SUB-S/C POINT 221.82 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 11.9 km



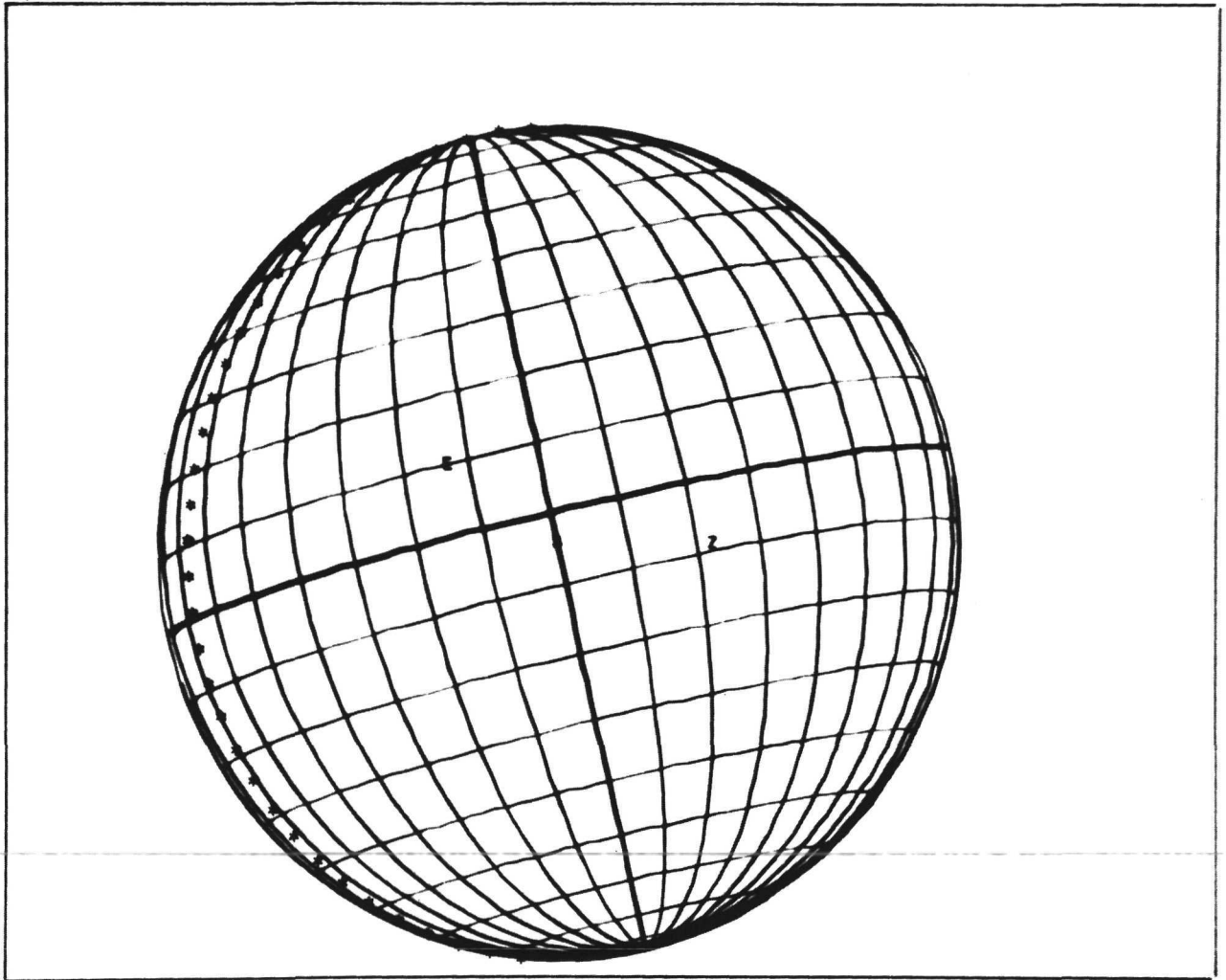
7 FE 75

SHUTTERED 4 AUG 12 hr 49 min 16.250 sec (GMT)

ENCOUNTER MINUS 16 hr 11 min 32.643 sec

S/C ALTITUDE 411,588 km, LONG. OF SUB-S/C POINT 210.18 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 11.3 km



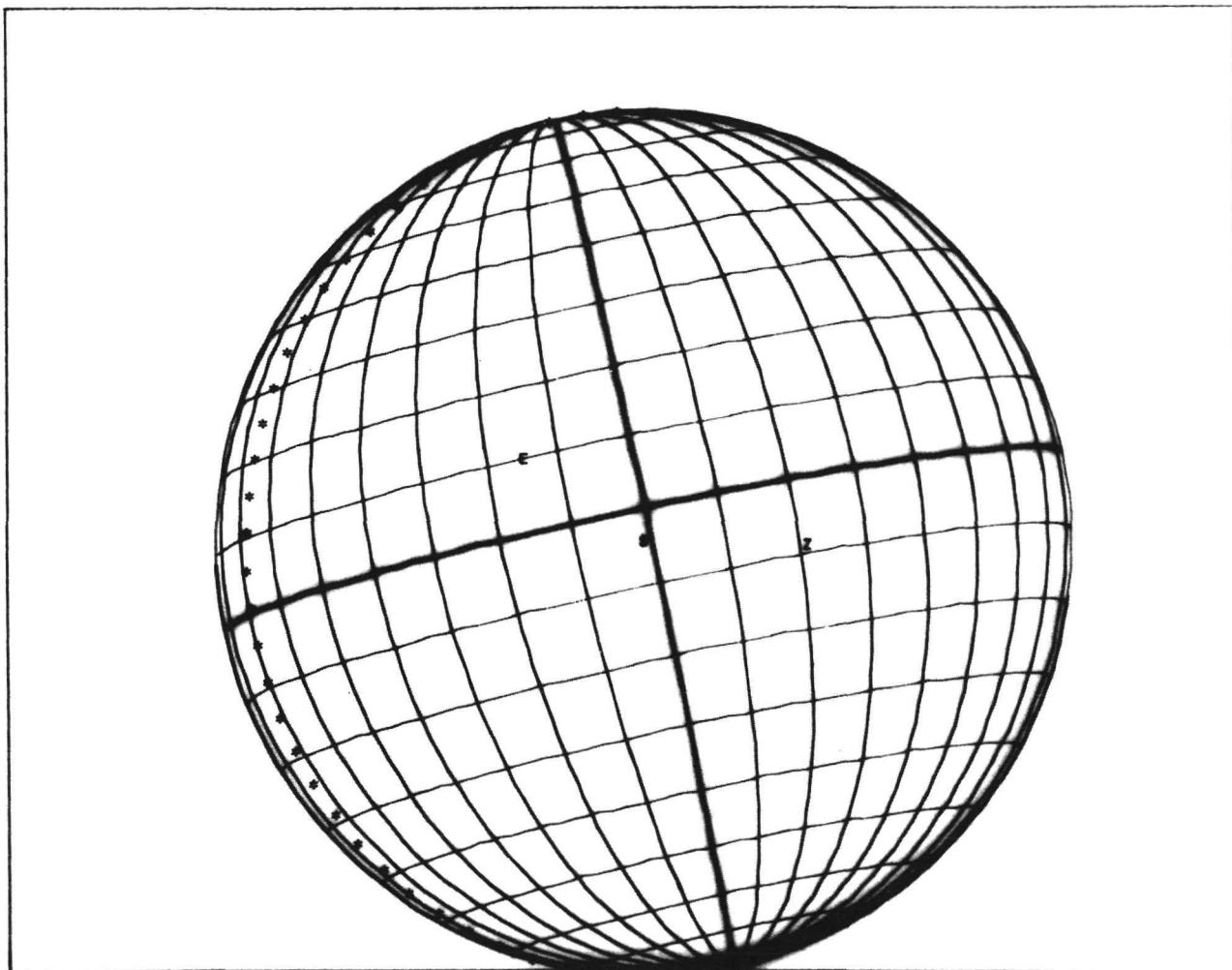
7 FE 76

SHUTTERED 4 AUG 13 hr 35 min 44.169 sec (GMT)

ENCOUNTER MINUS 15 hr 25 min 4.724 sec

S/C ALTITUDE 391,857.21 km, LONG. OF SUB-S/C POINT 198.89 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 10.8 km



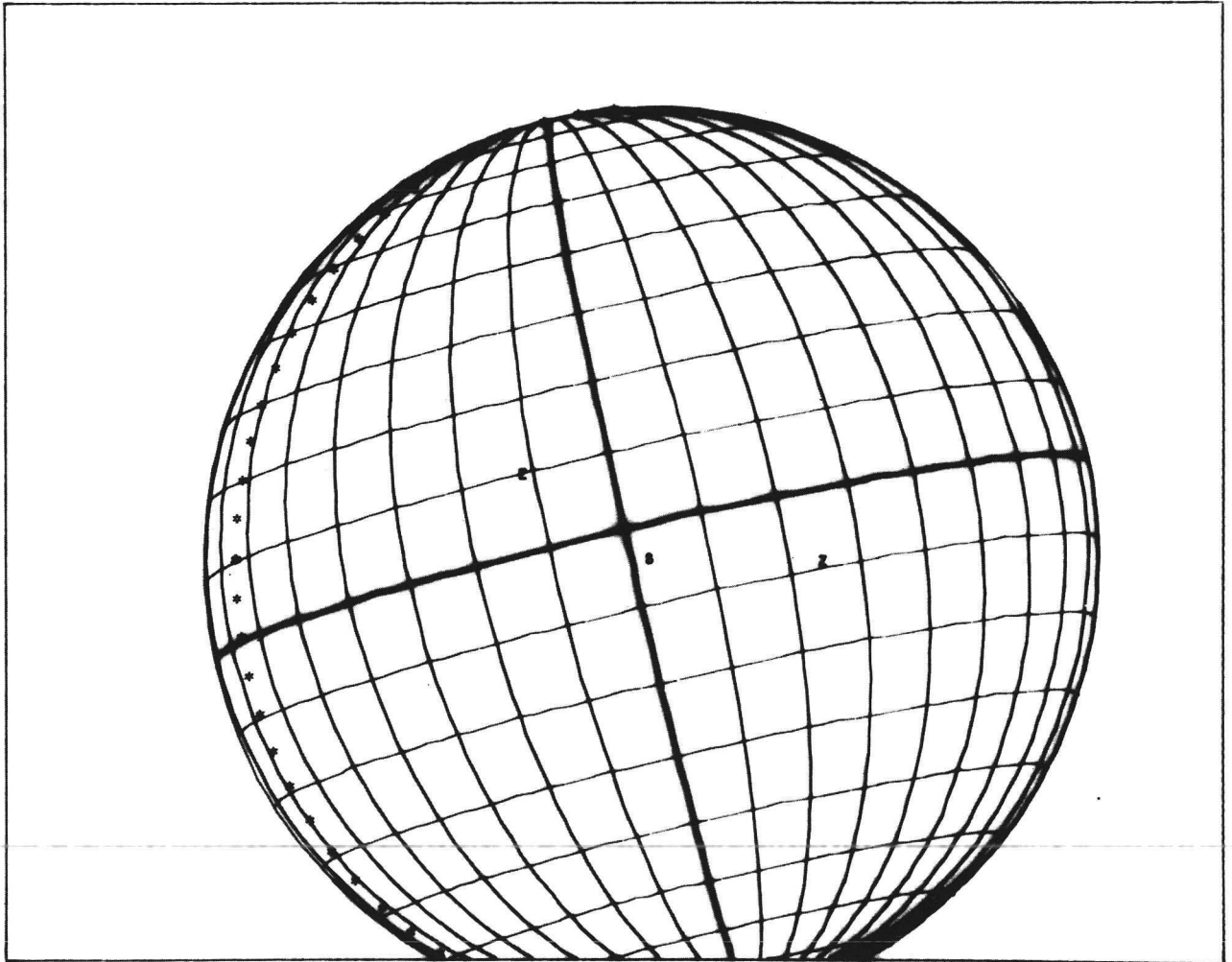
7 FE 77

SHUTTERED 4 AUG 14 hr 23 min 36.570 sec (GMT)

ENCOUNTER MINUS 14 hr 37 min 12.323 sec

S/C ALTITUDE 371,526.65 km, LONG. OF SUB-S/C POINT 187.26 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 10.2 km



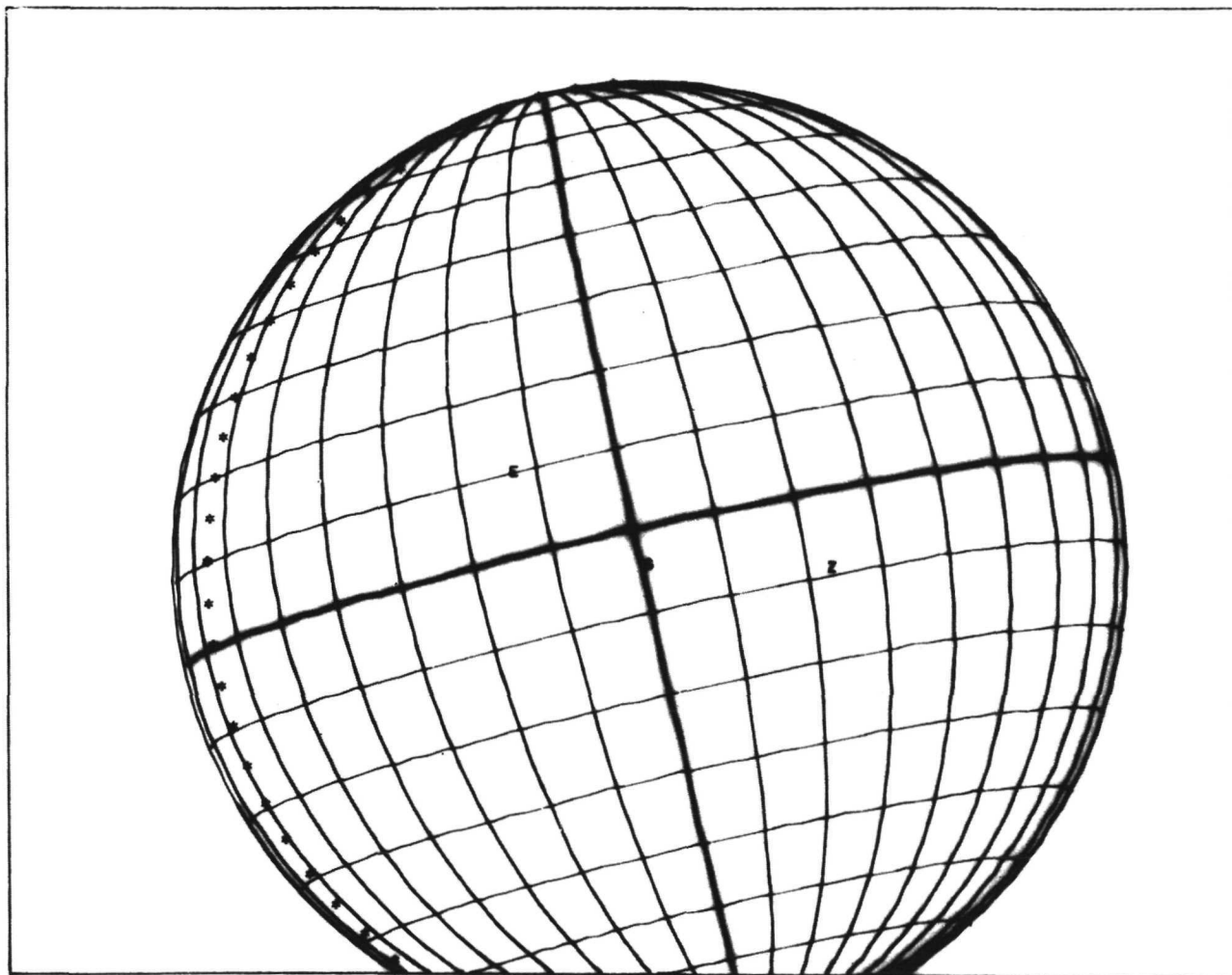
7 FE 78

SHUTTERED 4 AUG 15 hr 10 min 4.489 sec (GMT)

ENCOUNTER MINUS 13 hr 50 min 44.404 sec

S/C ALTITUDE 351,791.87 km, LONG. OF SUB-S/C POINT 175.98 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 9.7 km



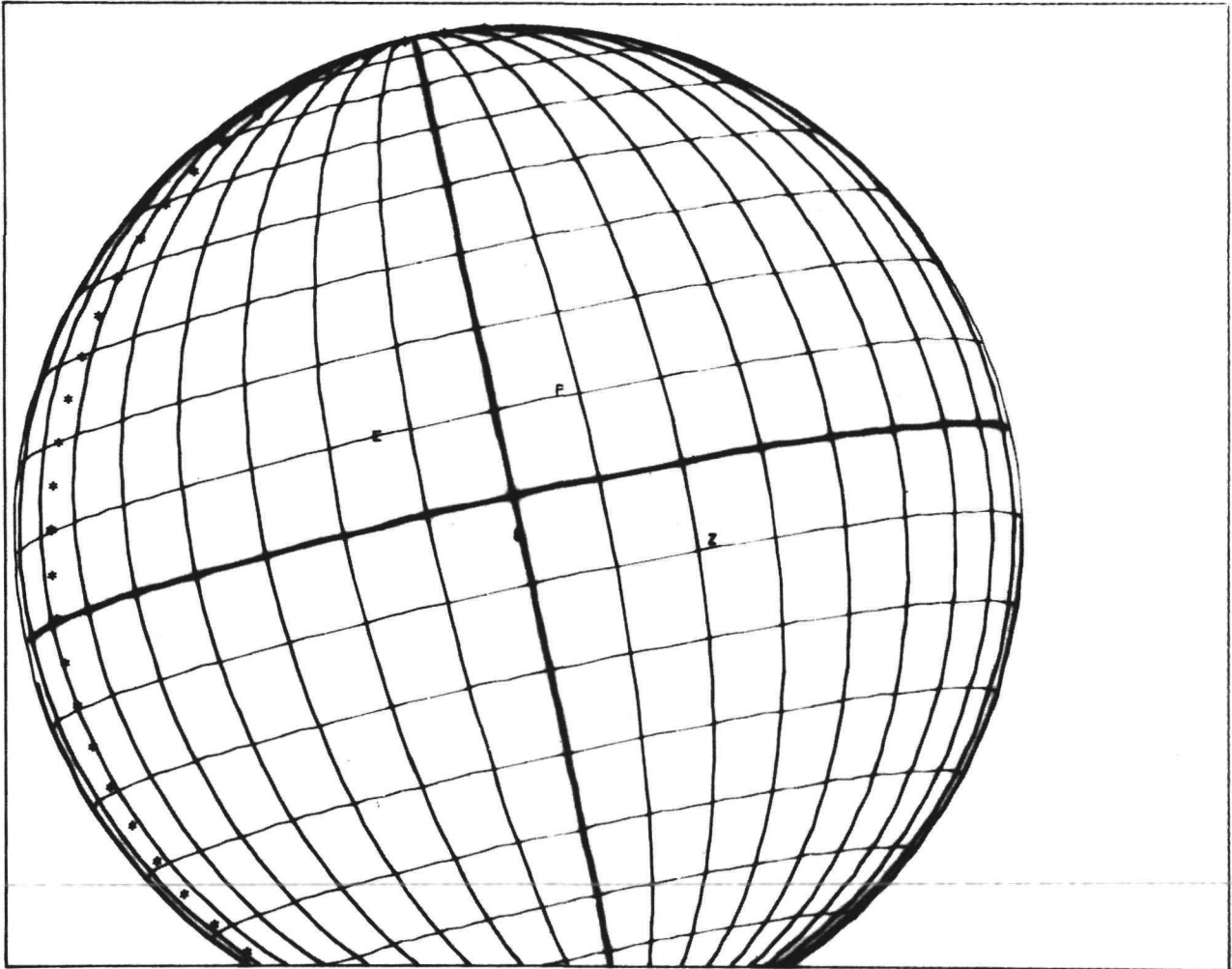
7 FE 79

SHUTTERED 4 AUG 15 hr 56 min 32.408 sec (GMT)

ENCOUNTER MINUS 13 hr 4 min 16.485 sec

S/C ALTITUDE 332,055.16 km, LONG. OF SUB-S/C POINT 164.70 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 9.1 km



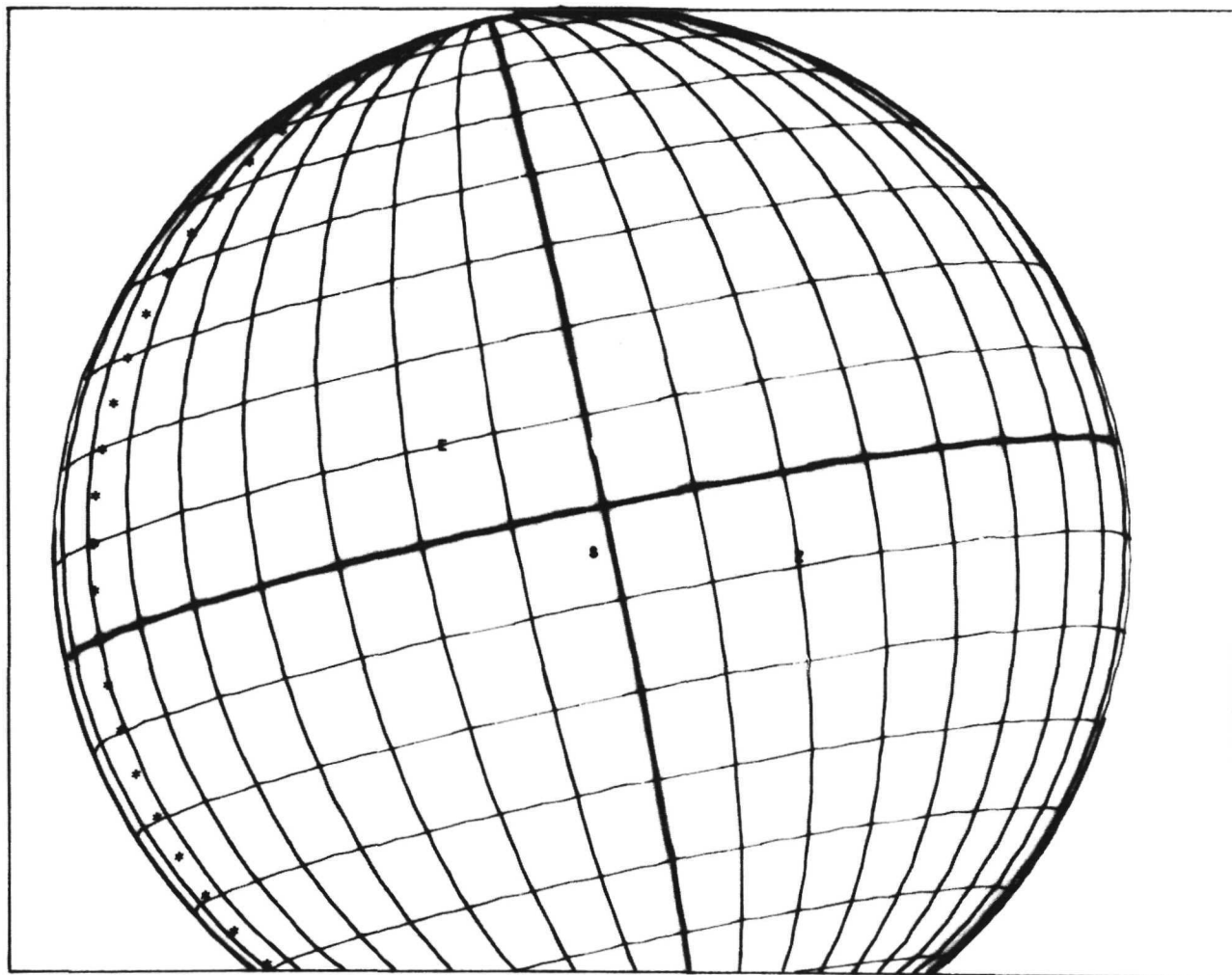
7 FE 80

SHUTTERED 4 AUG 16 hr 44 min 24.809 sec (GMT)

ENCOUNTER MINUS 12 hr 16 min 24.084 sec

S/C ALTITUDE 311,718.11 km, LONG. OF SUB-S/C POINT 152.97 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 8.6 km



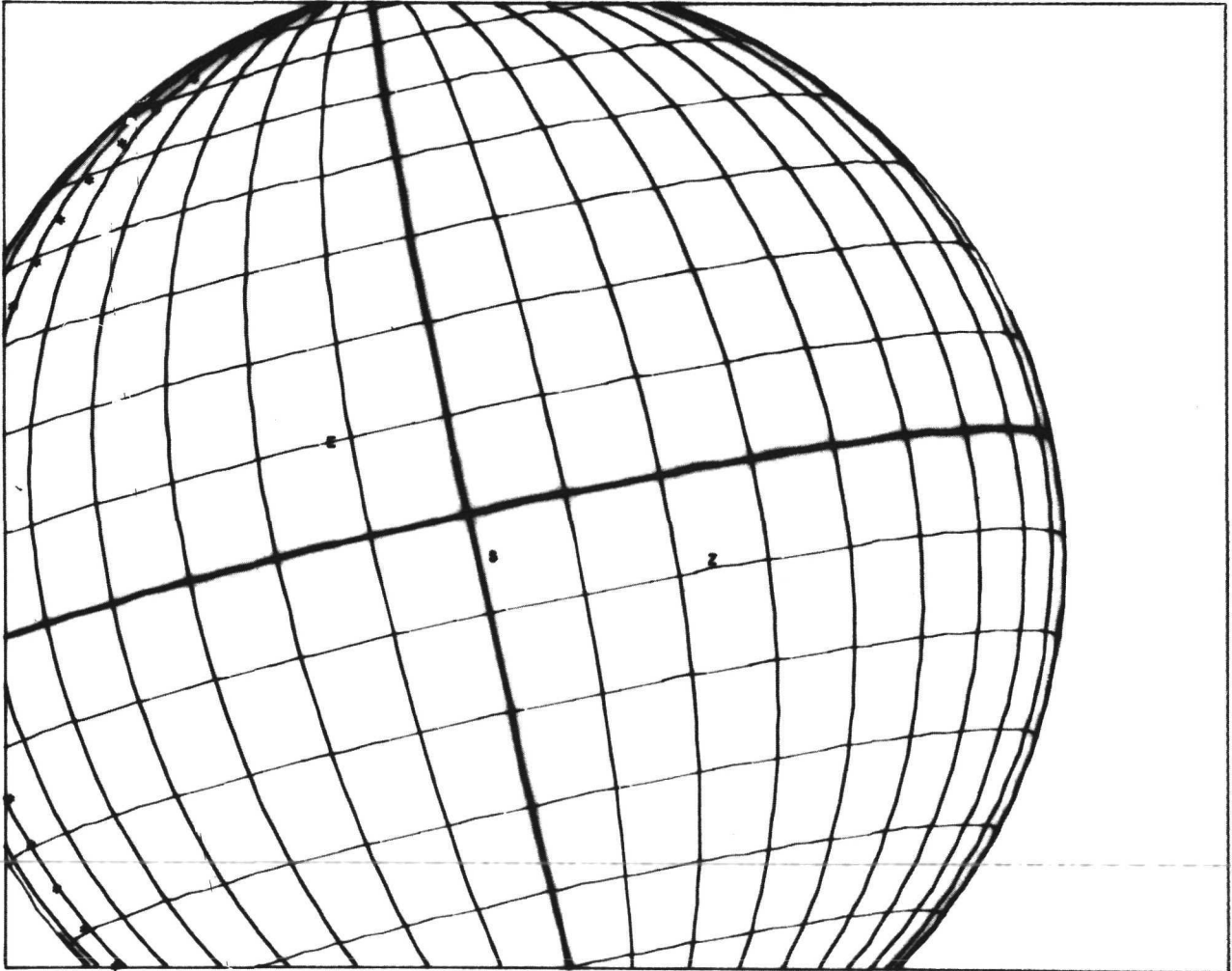
7 FE 81

SHUTTERED 4 AUG 17 hr 30 min 52.728 sec (GMT)

ENCOUNTER MINUS 11 hr 30 min 3.835 sec

S/C ALTITUDE 291,976.25 km, LONG. OF SUB-S/C POINT 141.70 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 8.0 km



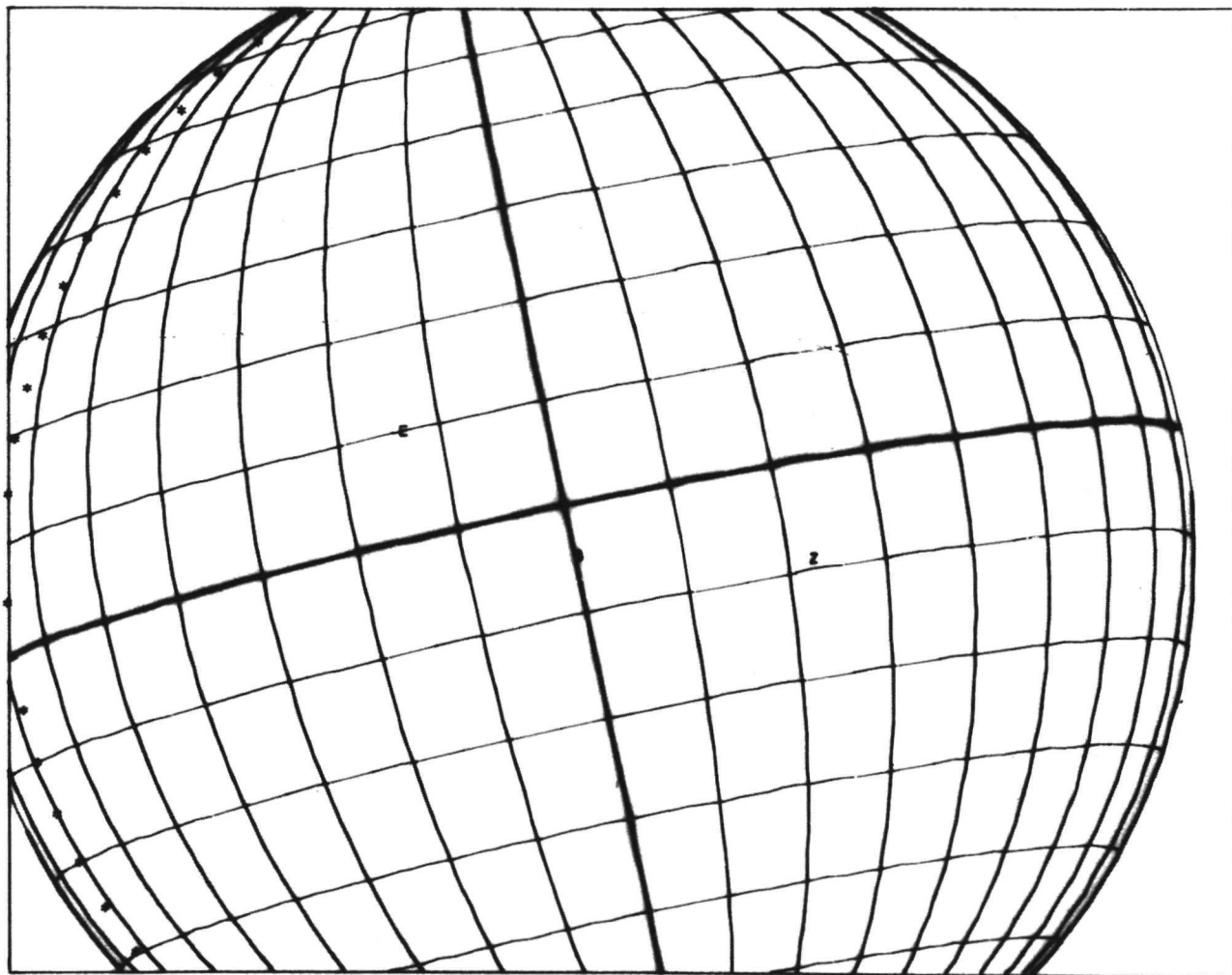
7 FE 82

SHUTTERED 4 AUG 18 hr 17 min 20.647 sec (GMT)

ENCOUNTER MINUS 10 hr 43 min 28.246 sec

S/C ALTITUDE 272,231.69 km, LONG. OF SUB-S/C POINT 130.44 deg EAST

GRID SPACING ON PLANET 10 deg GEOM PIXEL SPACING 7.5 km



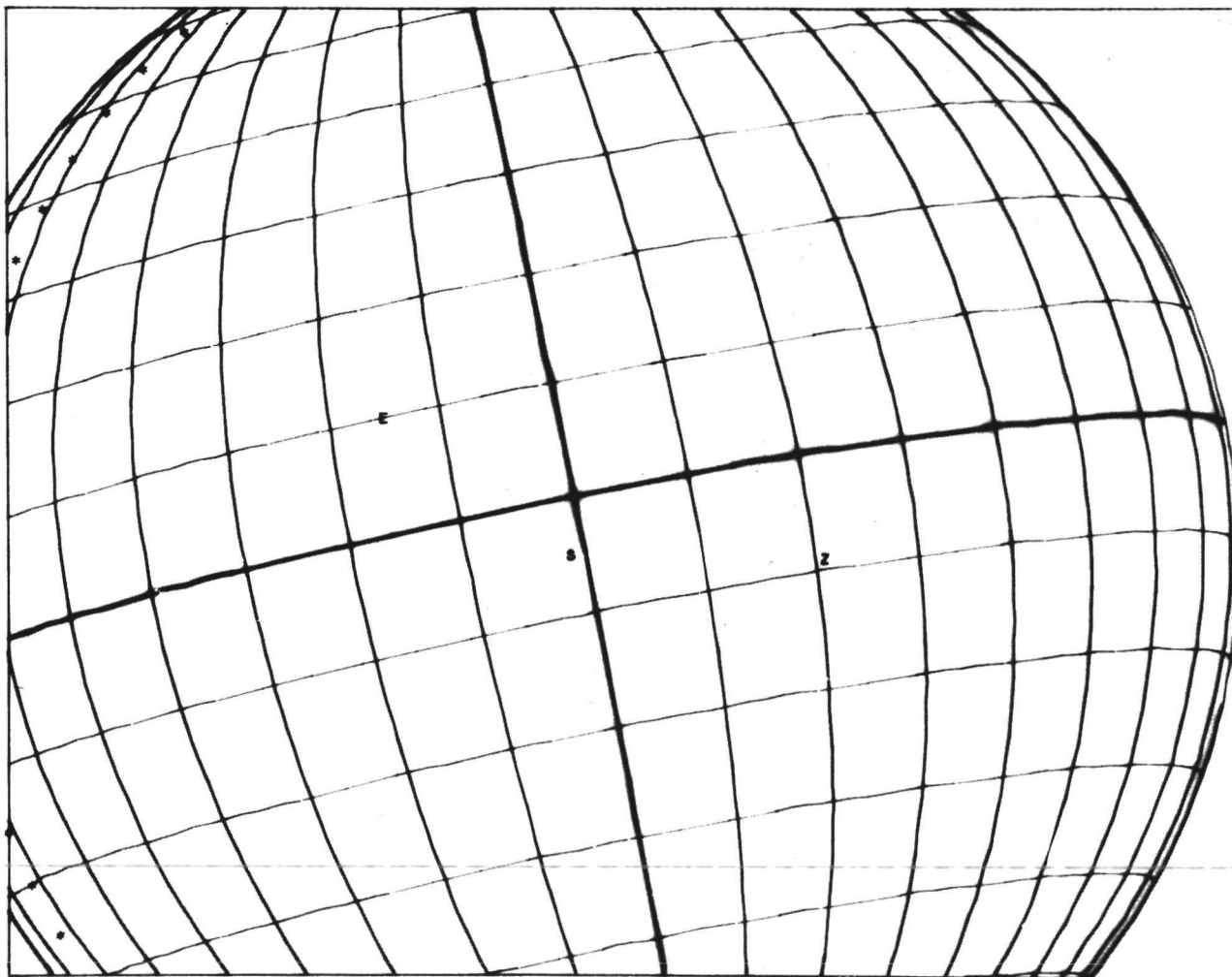
7 FE 83

SHUTTERED 4 AUG 19 hr 5 min 13.049 sec (GMT)

ENCOUNTER MINUS 9 hr 55 min 35.844 sec

S/C ALTITUDE 251,885.68 km, LONG. OF SUB-S/C POINT 118.85 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 6.9 km



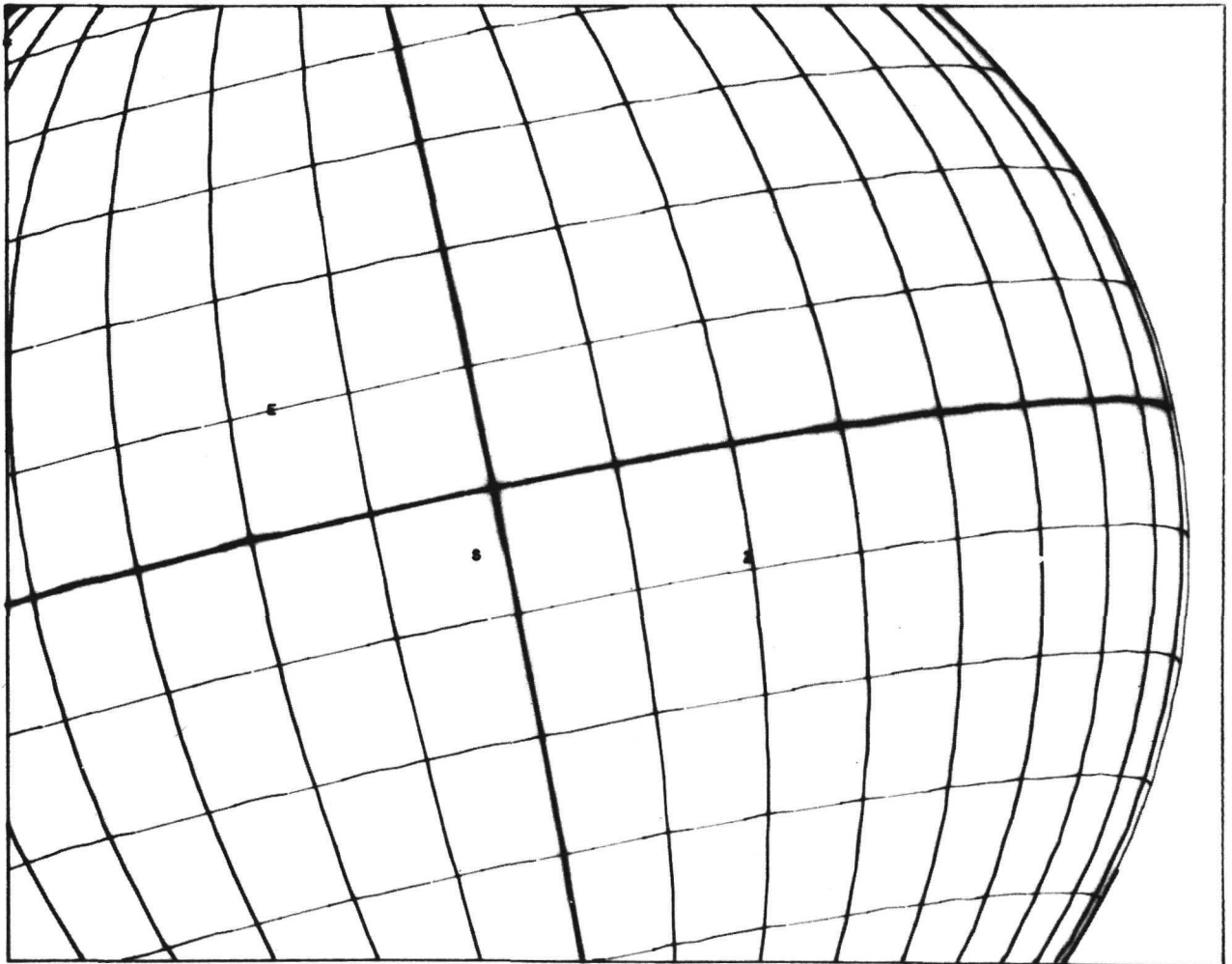
7 FE 84

SHUTTERED 4 AUG 19 hr 51 min 40.968 sec (GMT)

ENCOUNTER MINUS 9 hr 9 min 7.925 sec

S/C ALTITUDE 232,133.75 km, LONG. OF SUB-S/C POINT 107.61 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 6.4 km



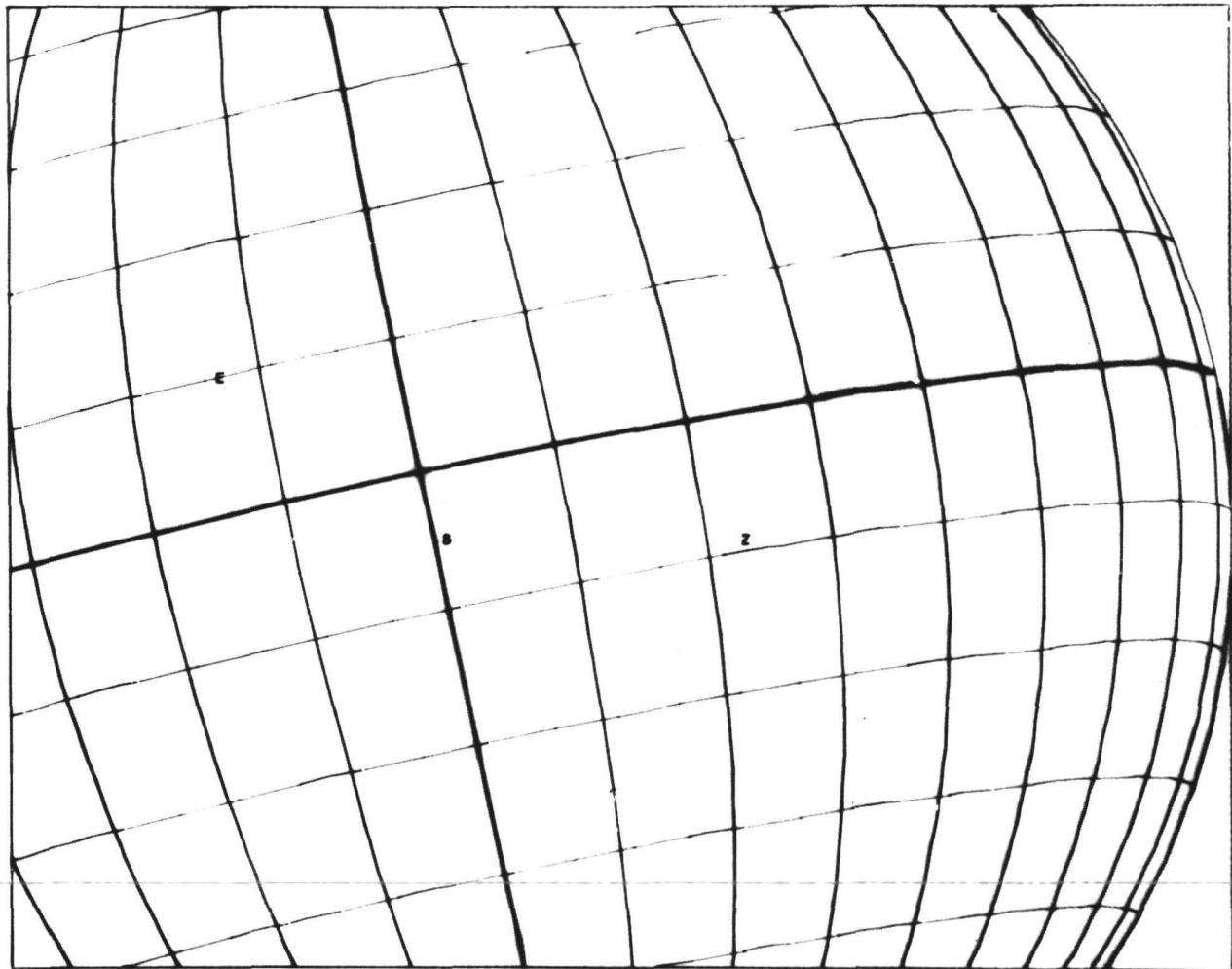
7 FE 85

SHUTTERED 4 AUG 20 hr 39 min 33.369 sec (GMT)

ENCOUNTER MINUS 8 hr 21 min 15.524 sec

S/C ALTITUDE 211,779.14 km, LONG. OF SUB-S/C POINT 96.05 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 5.8 km



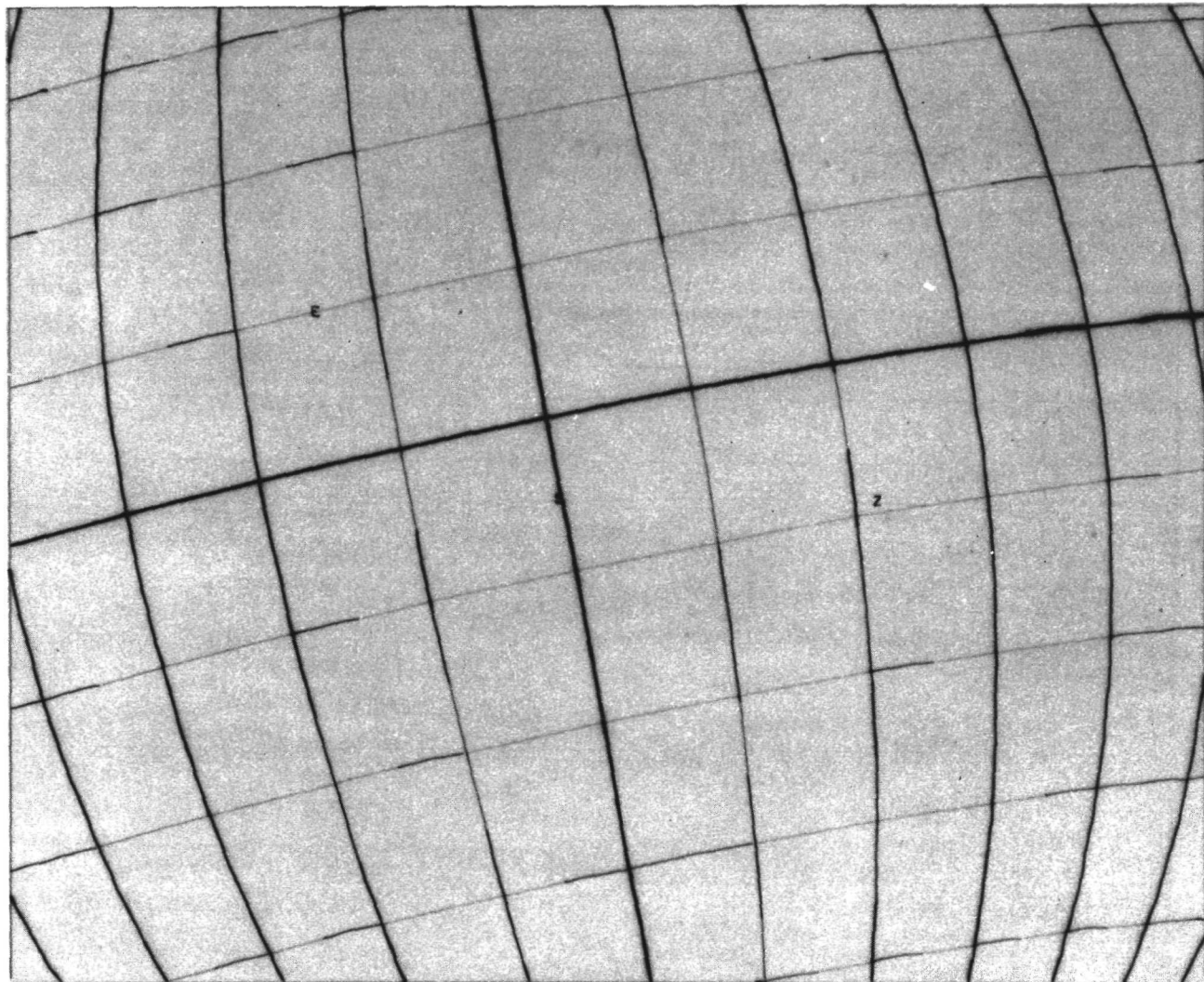
7 FE 86

SHUTTERED 4 AUG 21 hr 26 min 1.288 sec (GMT)

ENCOUNTER MINUS 7 hr 34 min 47.605 sec

S/C ALTITUDE 192,018 km, LONG. OF SUB-S/C POINT 84.84 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 5.3 km



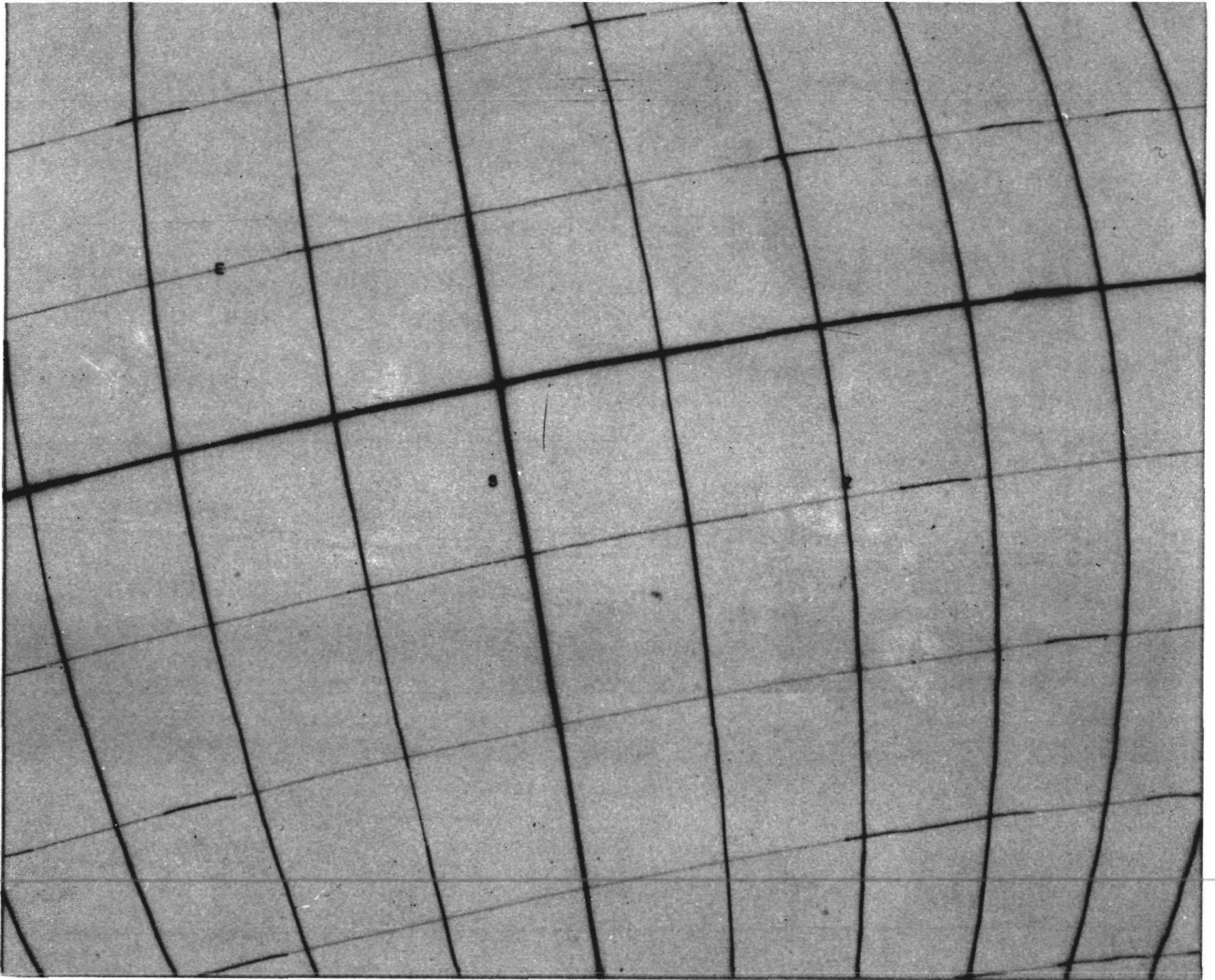
7 FE 87

SHUTTERED 4 AUG 22 hr 12 min 29.207 sec (GMT)

ENCOUNTER MINUS 6 hr 48 min 19.686 sec

S/C ALTITUDE 172,252 km, LONG. OF SUB-S/C POINT 73.67 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 4.8 km



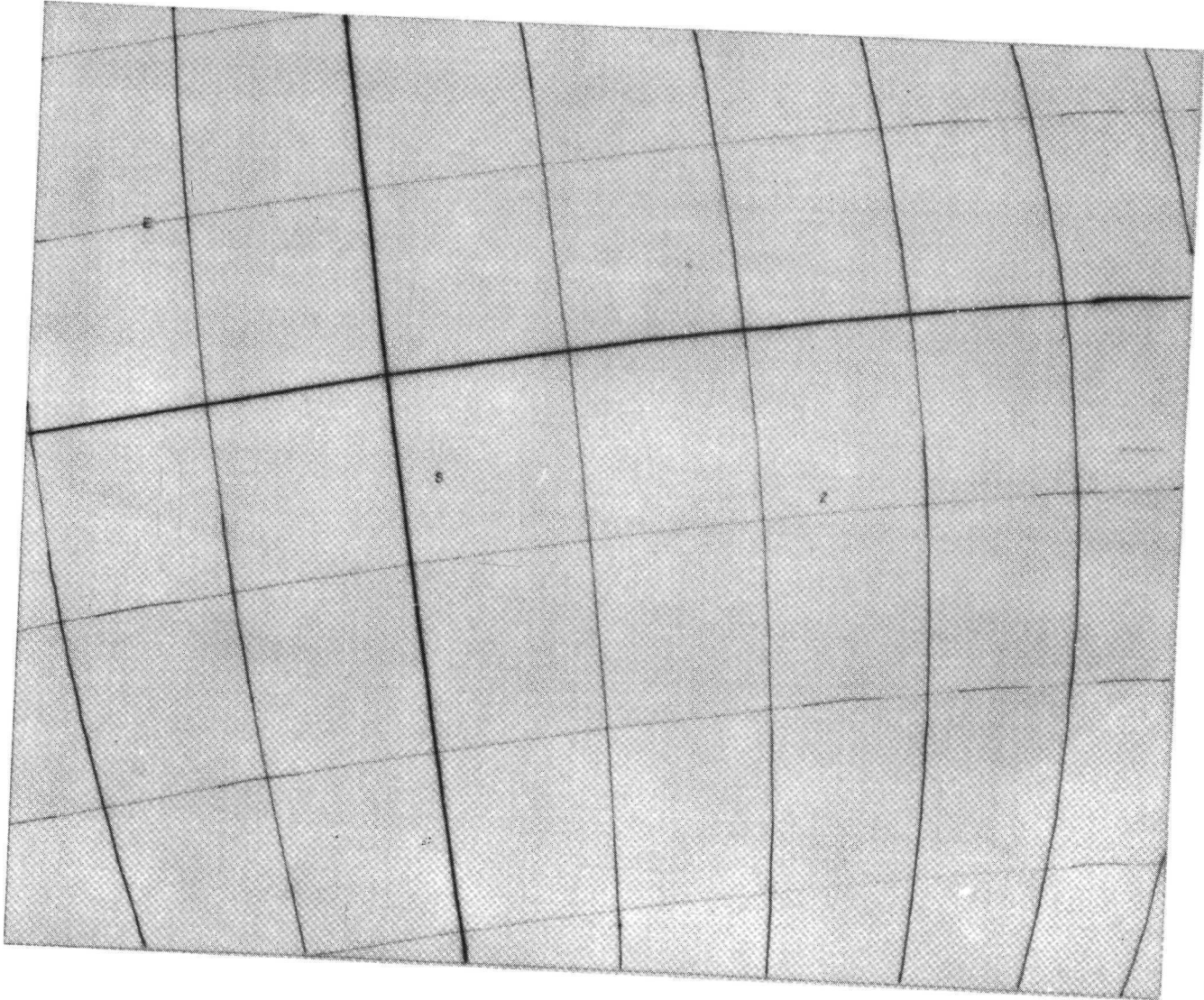
7 FE 88

SHUTTERED 4 AUG 23 hr 0 min 21.608 sec (GMT)

ENCOUNTER MINUS 6 hr 0 min 27.285 sec

S/C ALTITUDE 151,879 km, LONG. OF SUB-S/C POINT 62.19 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 4.2 km



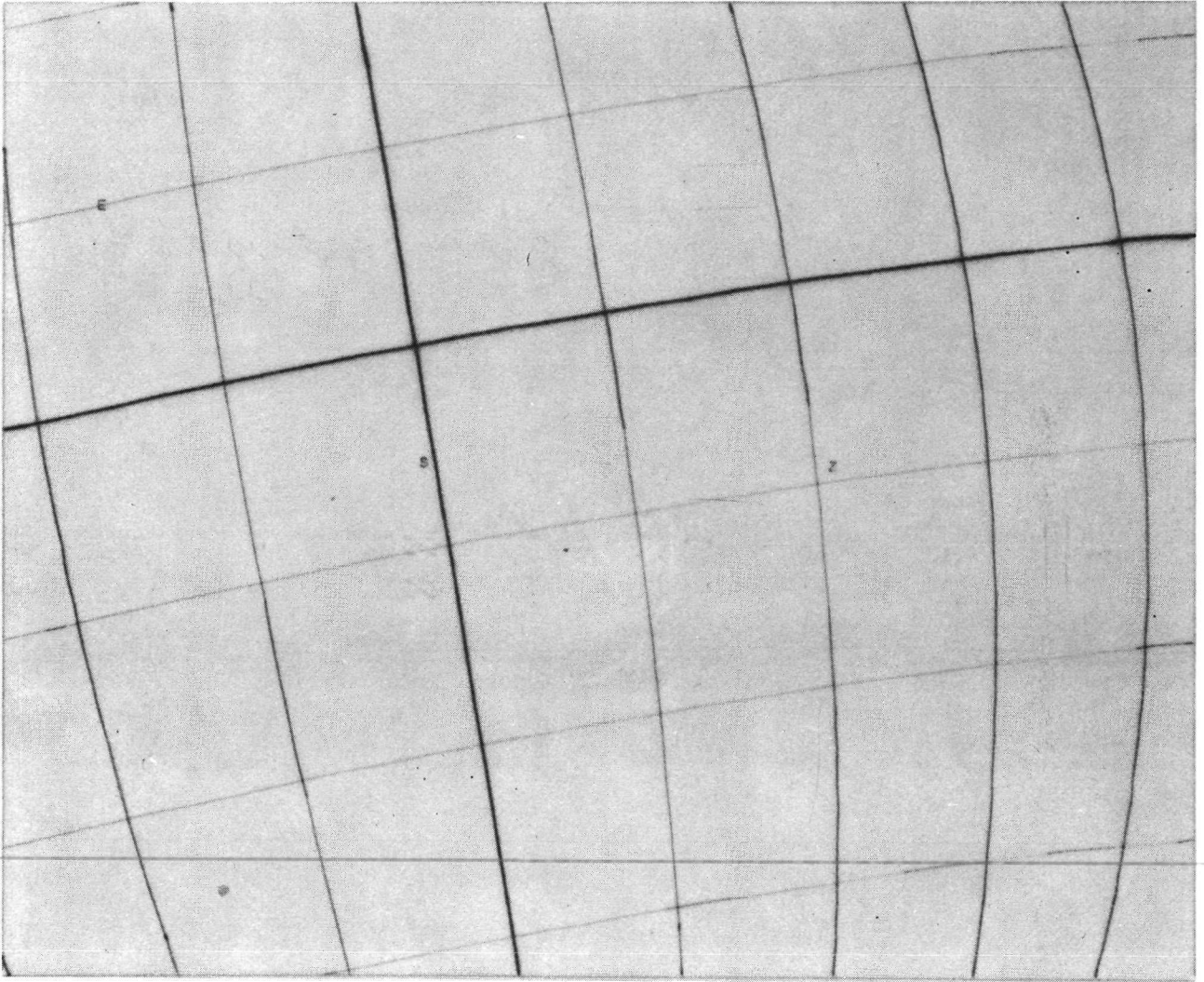
7 FE 89

SHUTTERED 4 AUG 23 hr 11 min 37.467 sec (GMT)

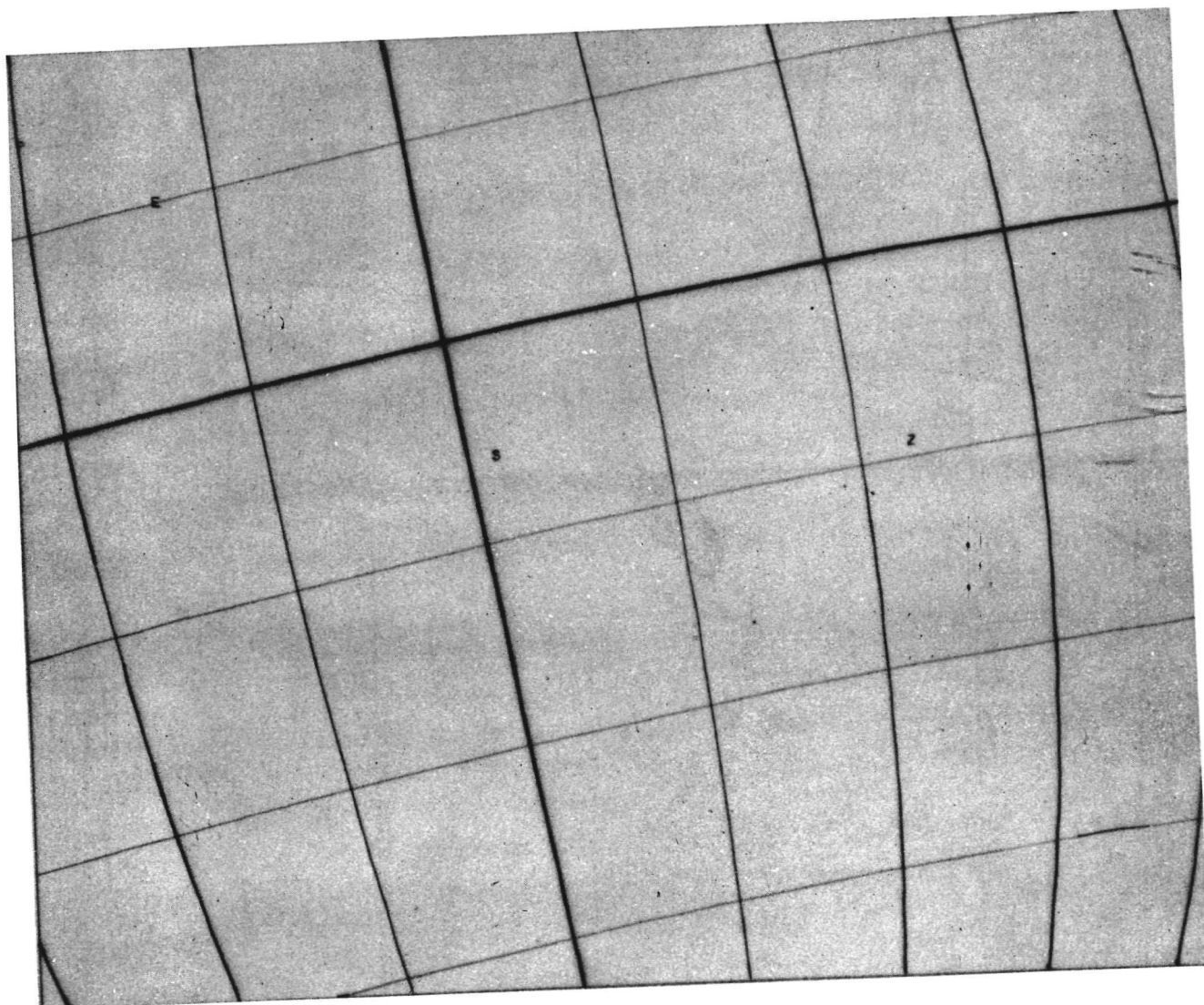
ENCOUNTER MINUS 5 hr 49 min 11.426 sec

S/C ALTITUDE 147,085 km, LONG. OF SUB-S/C POINT 59.50 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 4.0 km



7 FE 90
SHUTTERED 4 AUG 23 hr 24 min 17.809 sec (GMT)
ENCOUNTER MINUS 5 hr 36 min 31.084 sec
S/C ALTITUDE 141,690 km, LONG. OF SUB-S/C POINT 56.47 deg EAST
GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 3.9 km



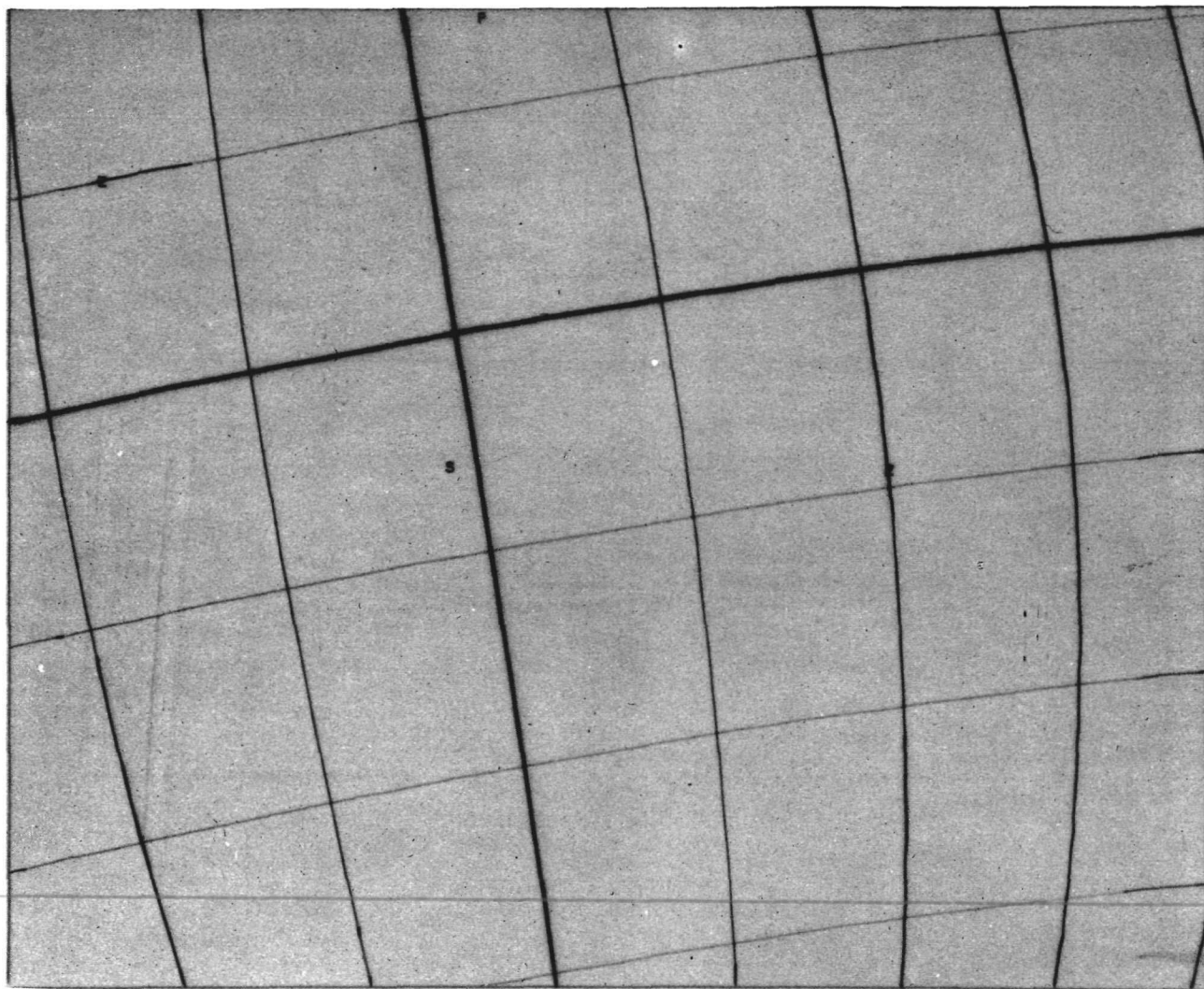
7 FE 91

SHUTTERED 4 AUG 23 hr 35 min 33.668 sec (GMT)

ENCOUNTER MINUS 5 hr 25 min 15.225 sec

S/C ALTITUDE 136,894 km, LONG. OF SUB-S/C POINT 53.79 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 3.7 km



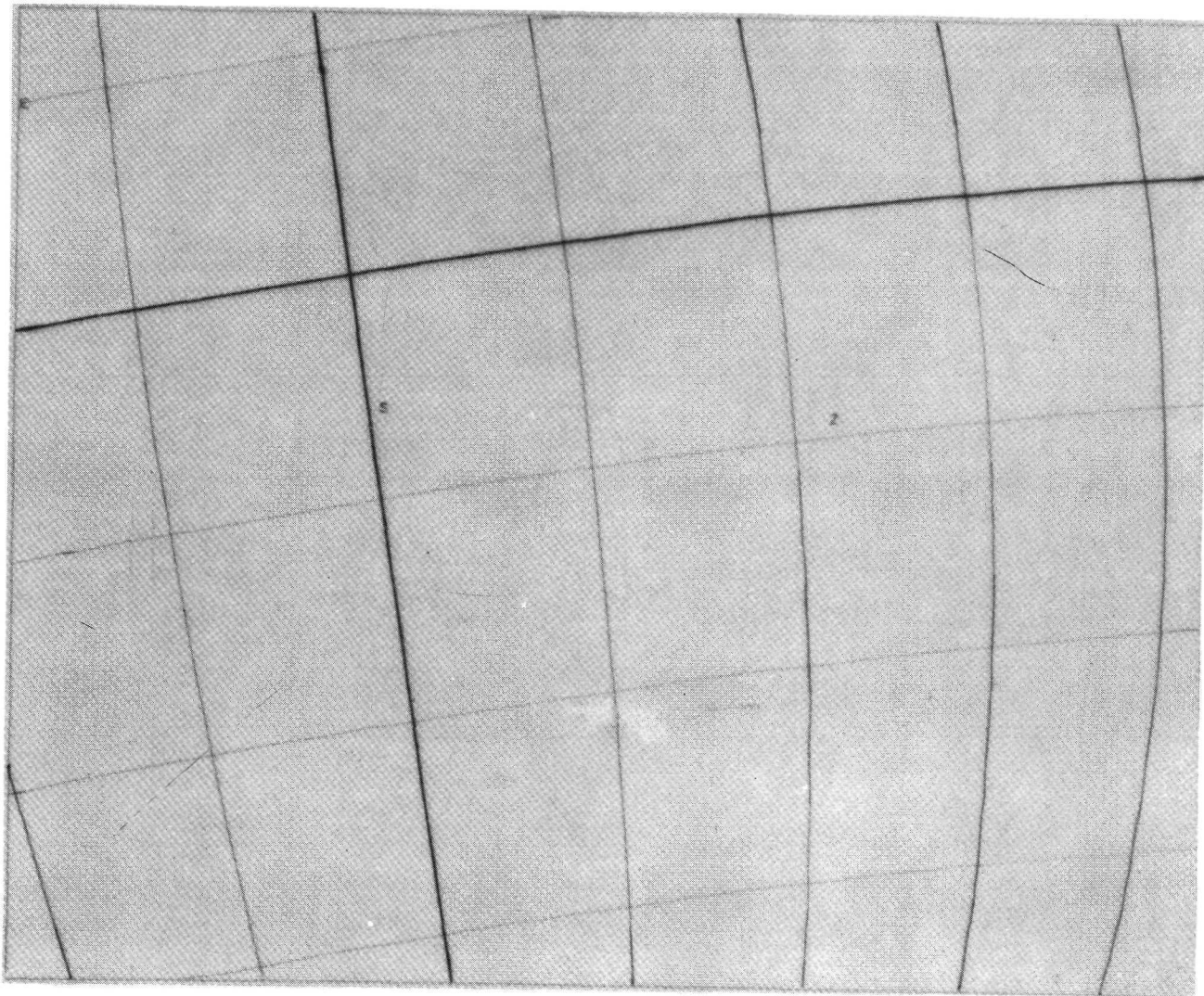
7 FE 92

SHUTTERED 4 AUG 23 hr 48 min 14.009 sec (GMT)

ENCOUNTER MINUS 5 hr 12 min 34.884 sec

S/C ALTITUDE 131,499 km, LONG. OF SUB-S/C POINT 50.77 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 3.6 km



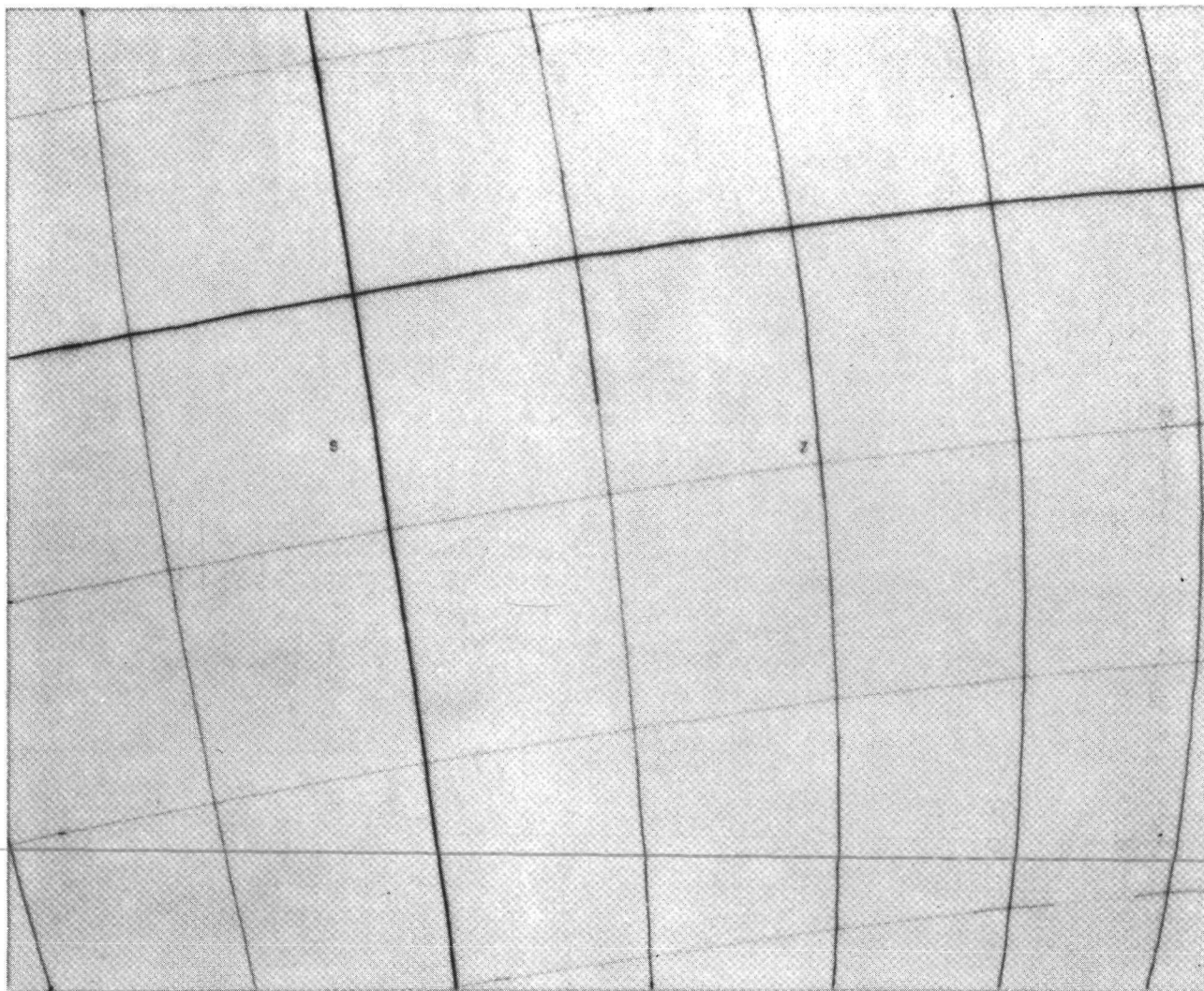
7 FE 93

SHUTTERED 4 AUG 23 hr 59 min 29.869 sec (GMT)

ENCOUNTER MINUS 5 hr 01 min 19.024 sec

S/C ALTITUDE 126,702 km, LONG. OF SUB-S/C POINT 48.10 deg EAST

GRID SPACING ON PLANET 10 deg, GEOM PIXEL SPACING 3.5 km



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MARINER 7 NEAR-ENCOUNTER CONIC PROJECTIONS

KEY: E sub-earth point
 S sub-spacecraft point
 Z sub-solar point
 P Phobos
 D Deimos
 * terminator

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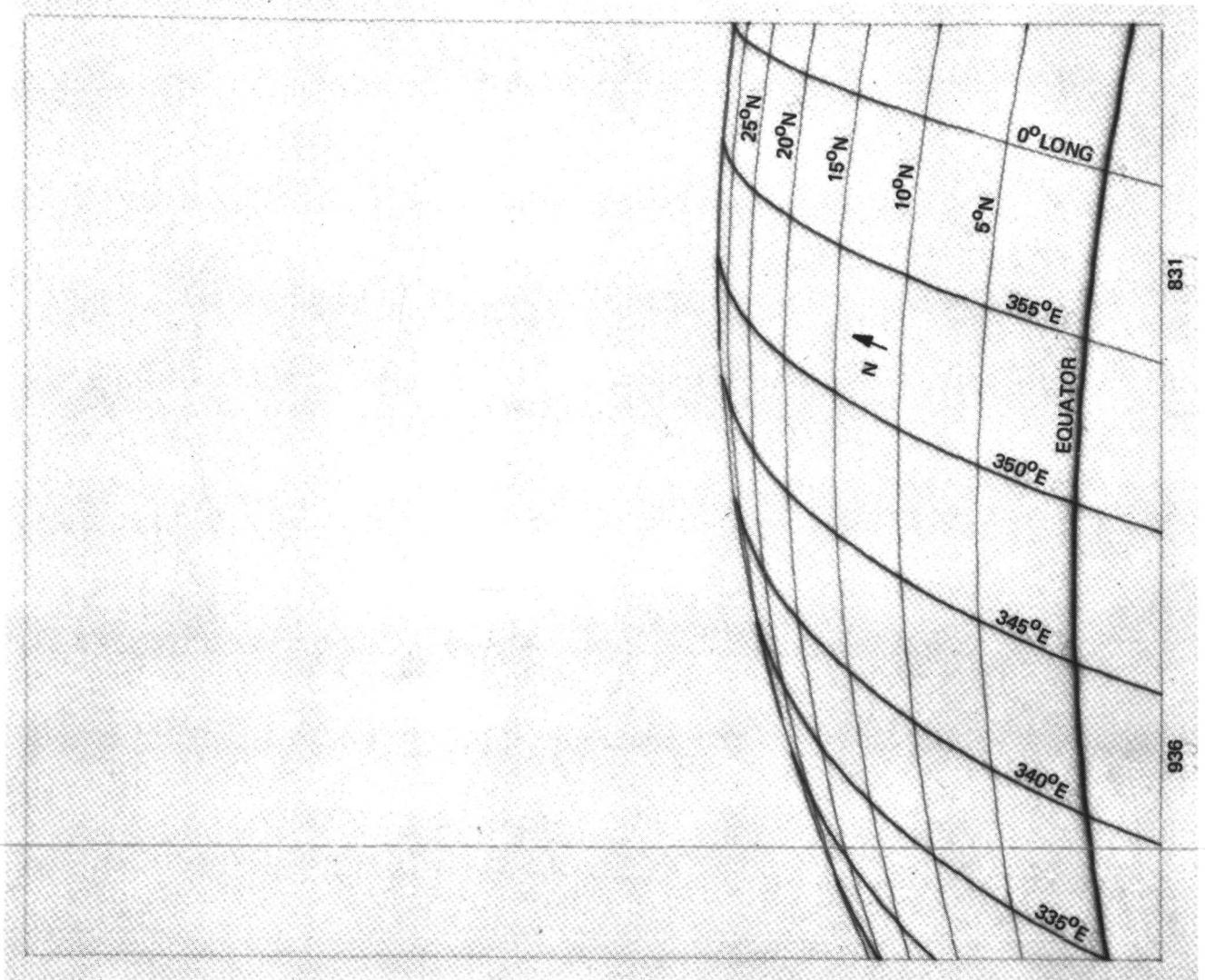
7 NE 1

SHUTTERED E- 20 min 24.7 sec

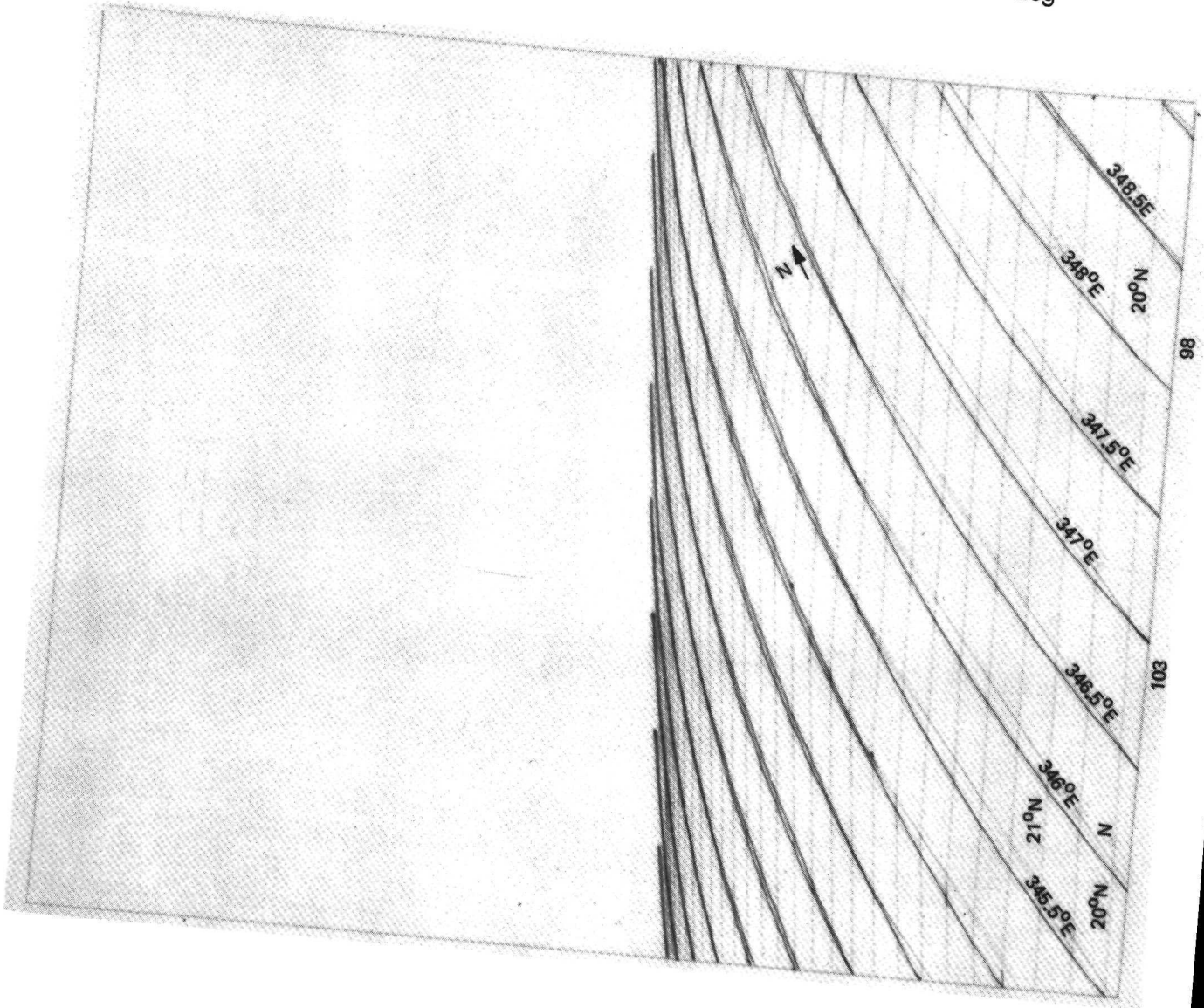
CONE ANGLE = 135.48 deg, CLOCK ANGLE = 217.34 deg, TWIST ANGLE = -0.32 deg

LAT OF CENTER = deg, LONG OF CENTER deg, GRID SPACING = 0.5 deg

SLANT RANGE = km, EM ANGLE = deg, IN ANGLE = deg



7 NE 2
 SHUTTERED E- 19 min 42.5 sec
 CONE ANGLE = 135.72 deg, CLOCK ANGLE = 217.51 deg, TWIST ANGLE = -0.08 deg
 LAT OF CENTER = deg, LONG OF CENTER = deg, GRID SPACING = 0.5 deg
 SLANT RANGE = km, EM ANGLE = deg, IN ANGLE = deg



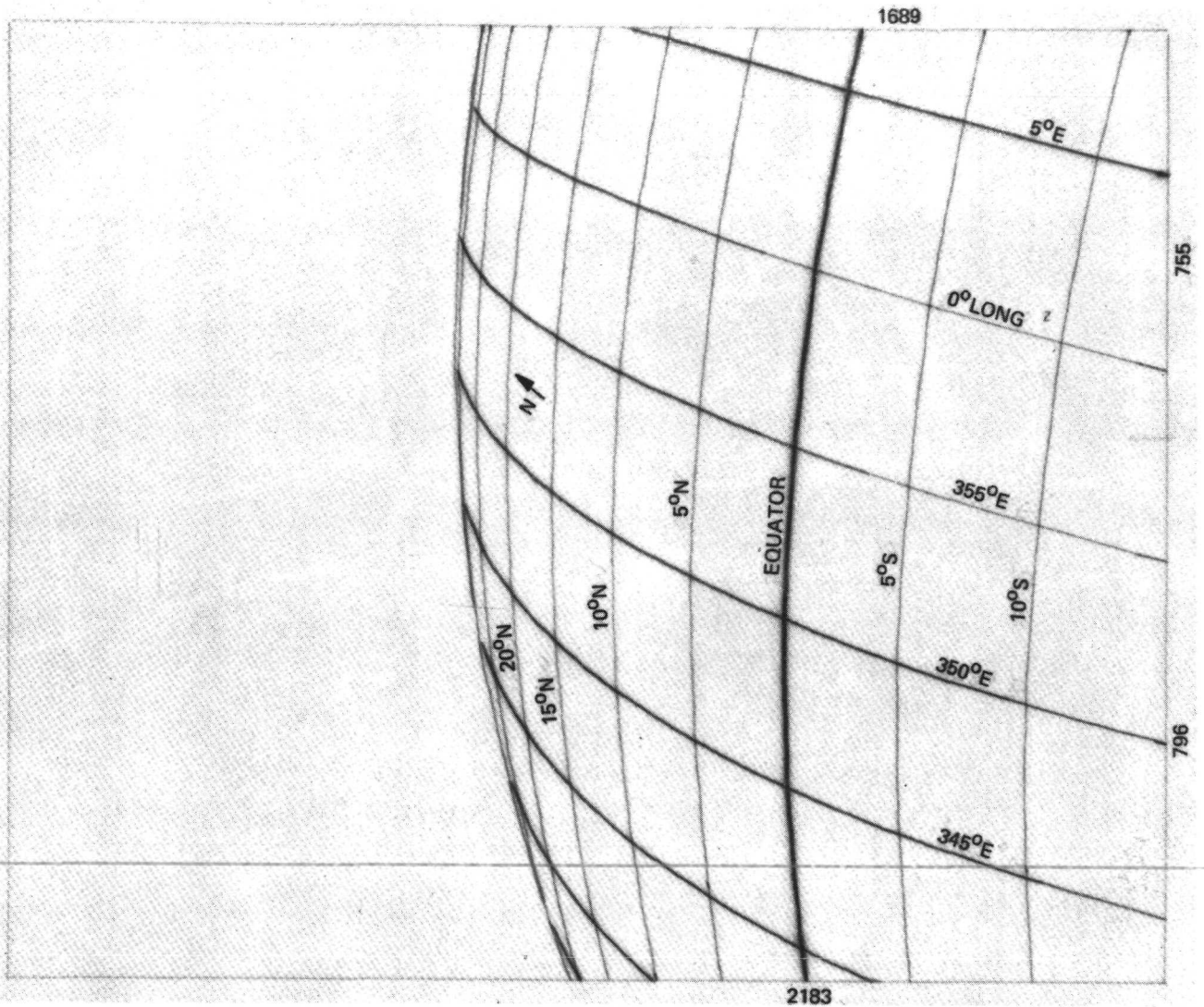
7 NE 3

SHUTTERED E- 19 min 0.3 sec

CONE ANGLE = 135.93 deg, CLOCK ANGLE = 217.67 deg, TWIST ANGLE = 0.13 deg

LAT OF CENTER = 11.7 deg, LONG OF CENTER = 350.5 deg, GRID SPACING = 5 deg

SLANT RANGE = 9117.6 km, EM ANGLE = 66.9 deg, IN ANGLE = 23.3 deg



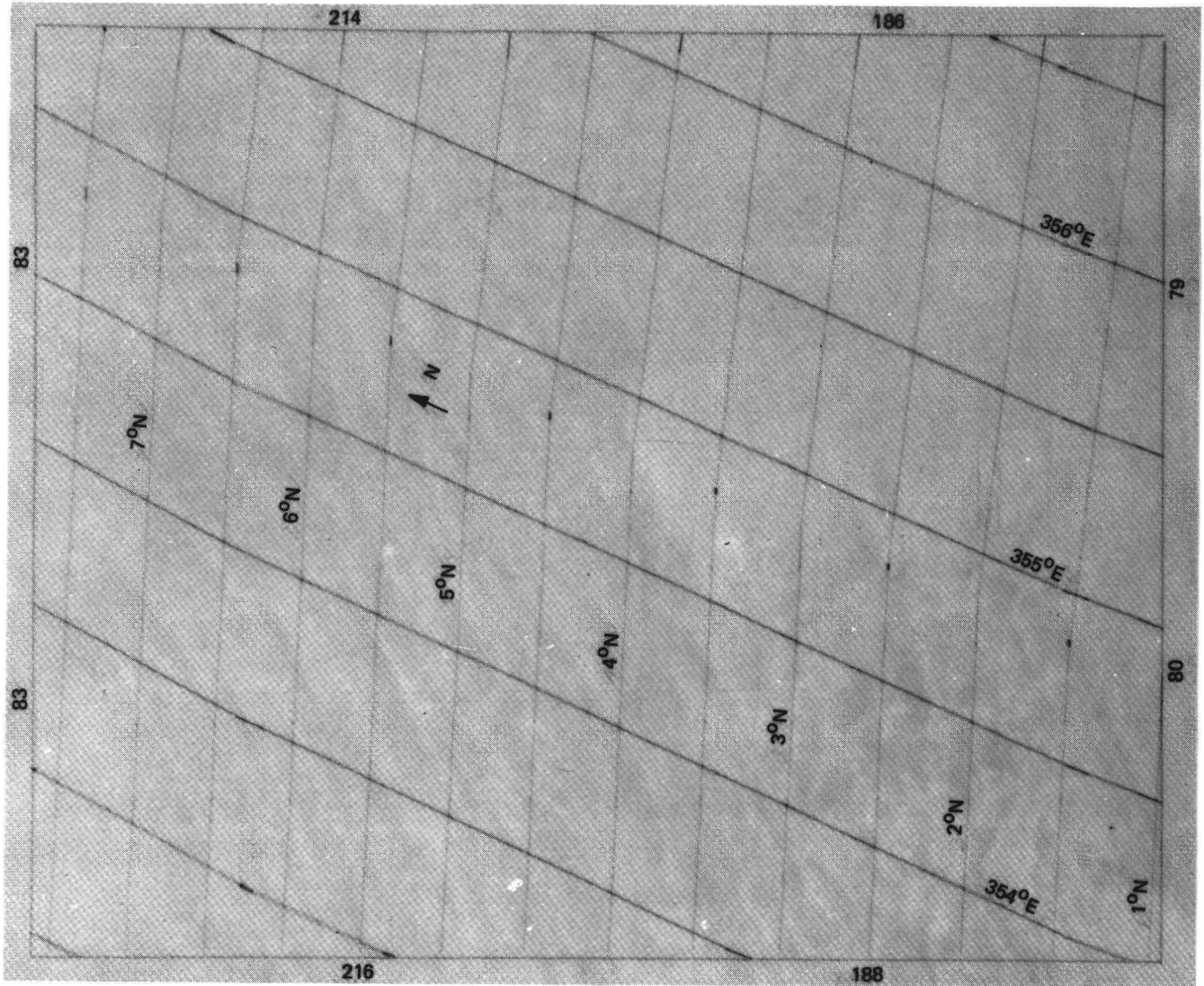
7 NE 4

SHUTTERED E- 18 min 18.1 sec

CONE ANGLE = 135.79 deg, CLOCK ANGLE = 217.69 deg, TWIST ANGLE = 0.16 deg

LAT OF CENTER = +0.1 deg, LONG OF CENTER = 354.7 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 8492.5 km, EM ANGLE = 58.5 deg, IN ANGLE = 14.6 deg



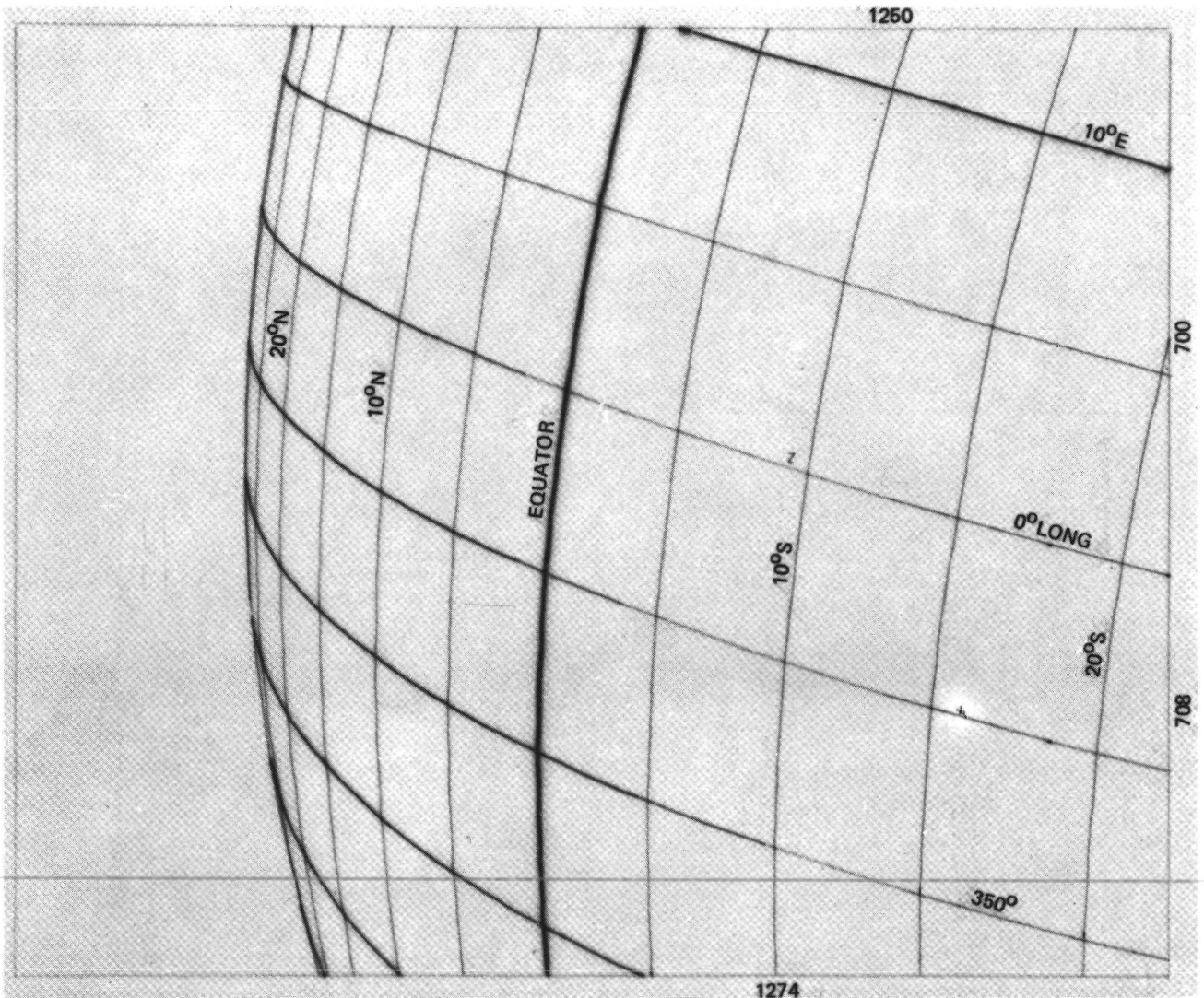
7 NE 5

SHUTTERED E- 17 min 35.8 sec

CONE ANGLE = 135.62 deg, CLOCK ANGLE = 217.66 deg, TWIST ANGLE = 0.12 deg

LAT OF CENTER = -1.9 deg, LONG OF CENTER = 357.4 deg, GRID SPACING = 5 deg

SLANT RANGE = 7995.1 km, EM ANGLE = 52.2 deg, IN ANGLE = 8.0 deg



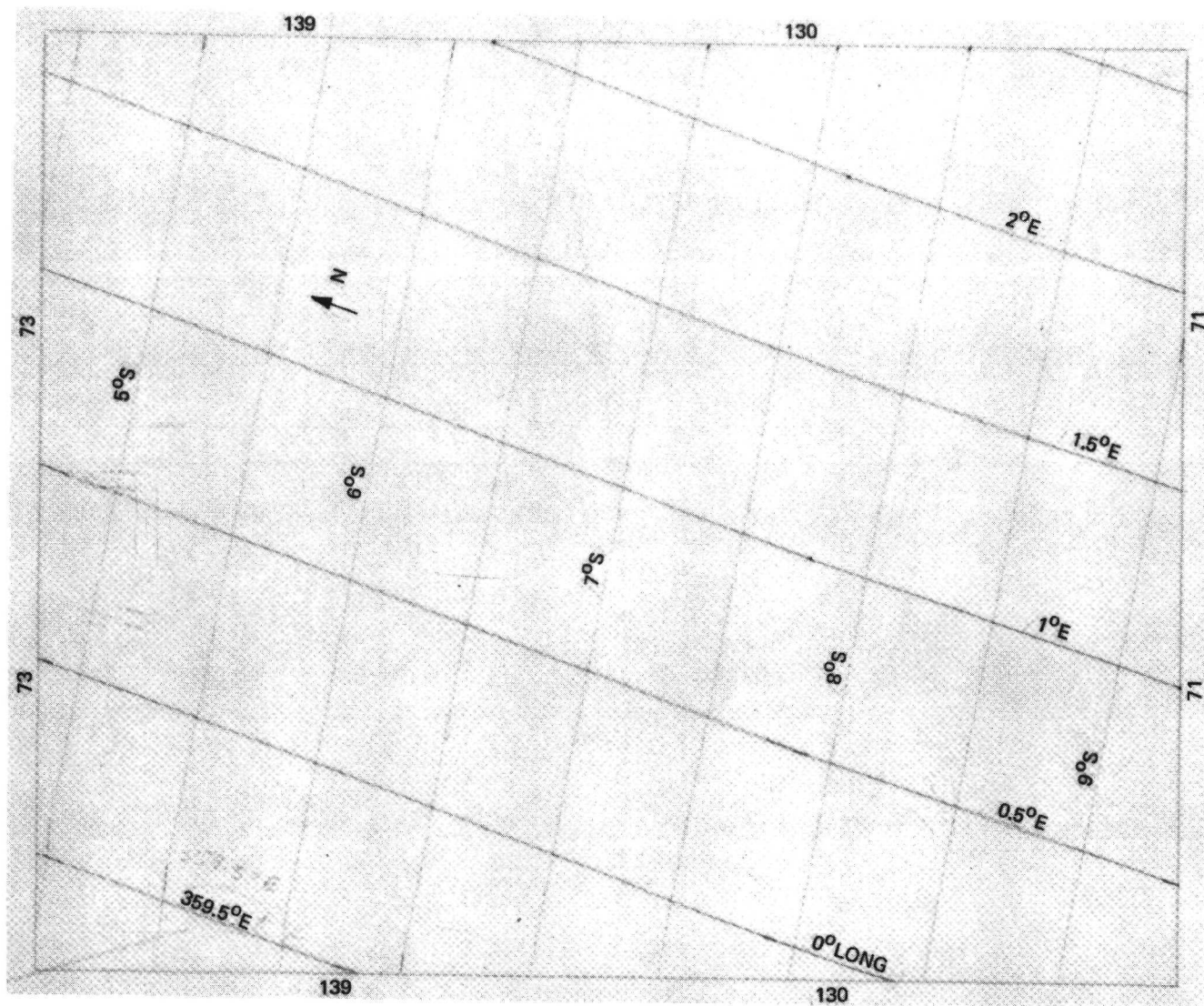
7 NE 6

SHUTTERED E- 16 min 53.6 sec

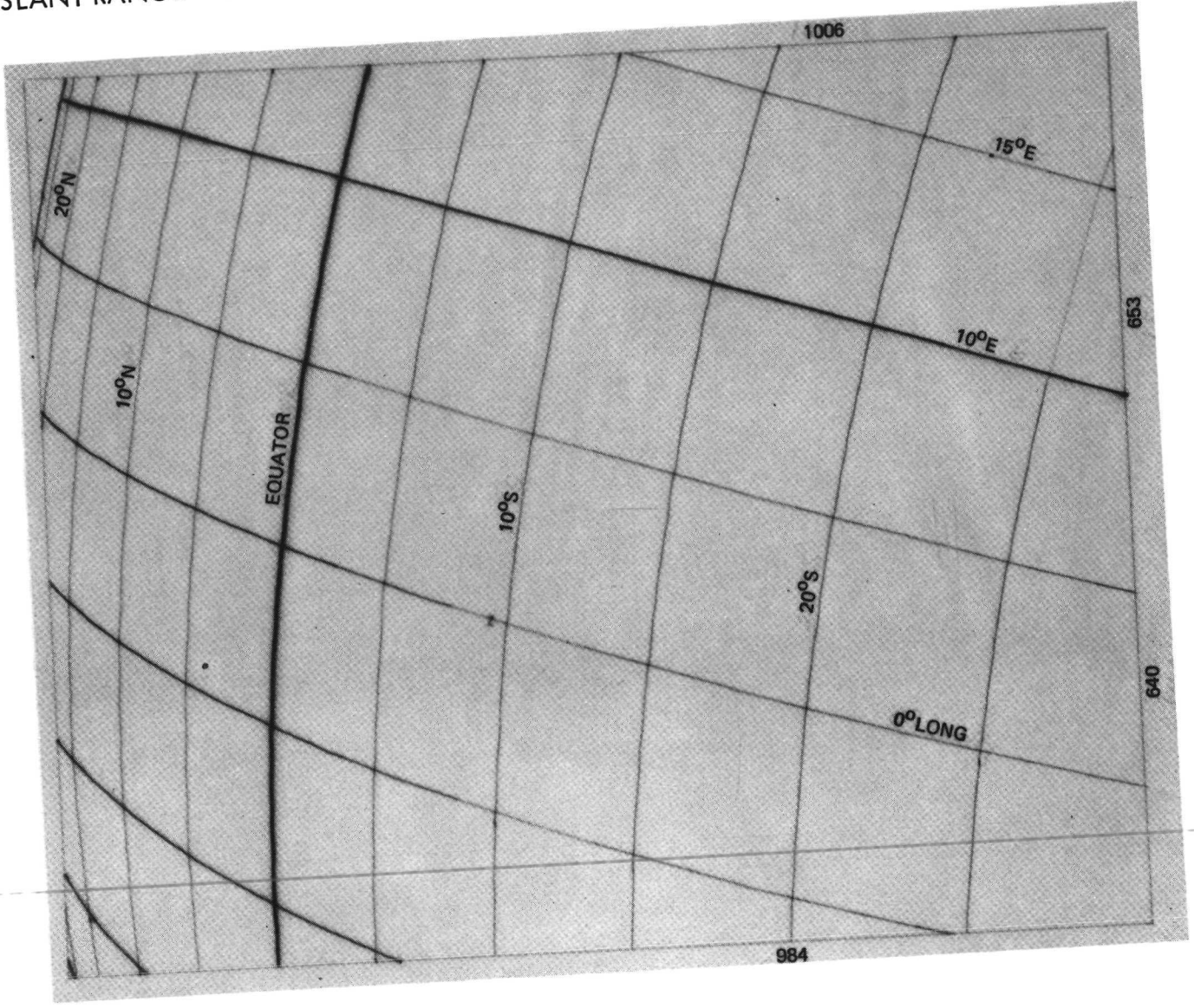
CONE ANGLE = 135.51 deg, CLOCK ANGLE = 217.62 deg, TWIST ANGLE = 0.06 deg

LAT OF CENTER = -7.0 deg, LONG OF CENTER = 0.9 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 7551.5 km, EM ANGLE = 46.4 deg, IN ANGLE = 24 deg



7 NE 7
SHUTTERED E- 16 min 11.3 sec
CONE ANGLE = 135.60 deg, CLOCK ANGLE = 217.56 deg, TWIST ANGLE = -0.02 deg
LAT OF CENTER = -12.4 deg, LONG OF CENTER = 3.7 deg, GRID SPACING = 5 deg
SLANT RANGE = 7135.9 km, EM ANGLE = 40.5 deg, IN ANGLE = 4.8 deg



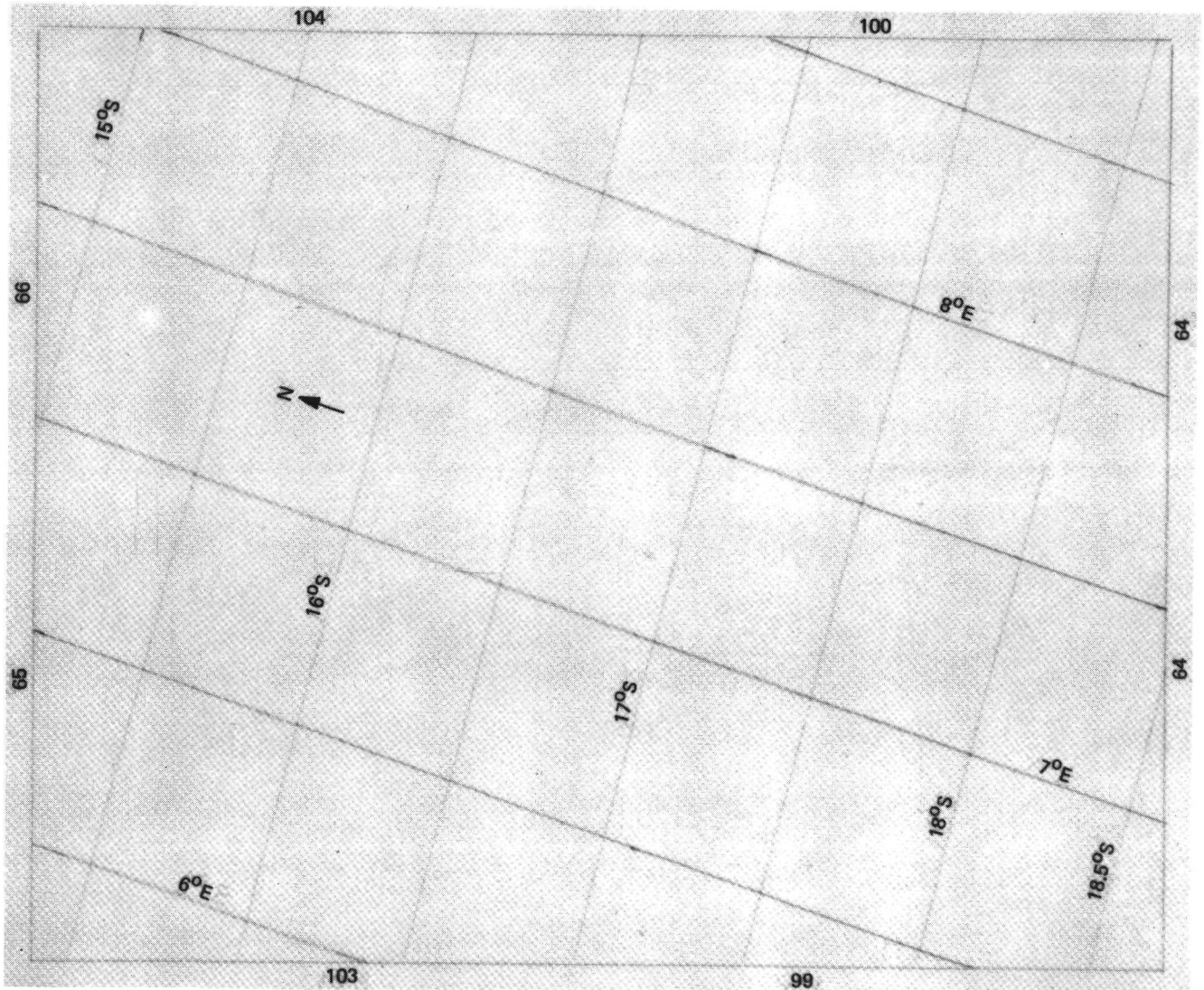
7 NE 8

SHUTTERED E- 15 min 29.1 sec

CONE ANGLE = 135.66 deg, CLOCK ANGLE = 217.49 deg, TWIST ANGLE = -0.10 deg

LAT OF CENTER = -16.8 deg, LONG OF CENTER = 7.3 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 6773.9 km, EM ANGLE = 35.5 deg, IN ANGLE = 10.5 deg



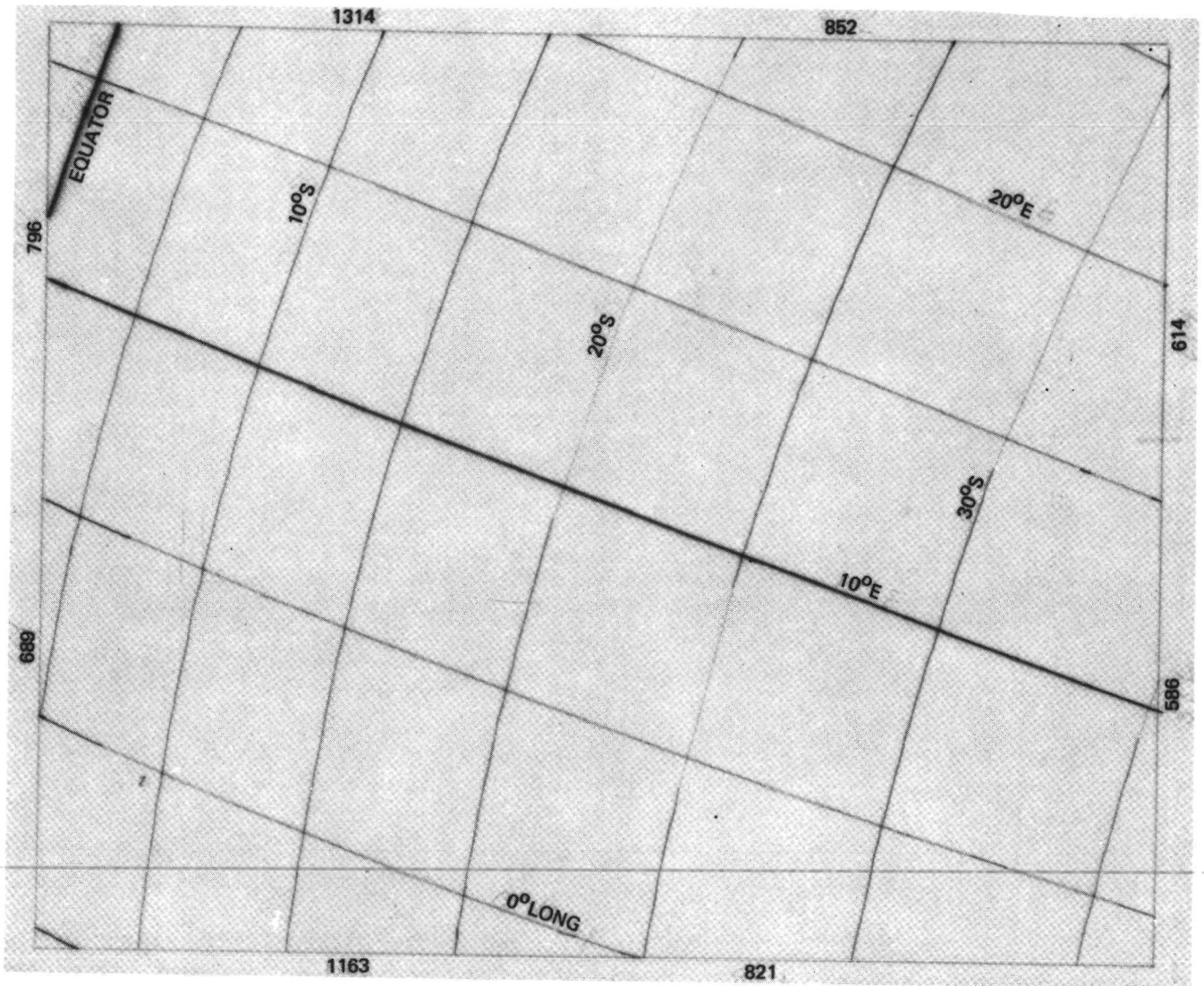
7 NE 9

SHUTTERED E- 14 min 46.8 sec

CONE ANGLE = 135.73 deg, CLOCK ANGLE = 217.44 deg, TWIST ANGLE = -0.18 deg

LAT OF CENTER = 21.1 deg, LONG OF CENTER = 10.1 deg, GRID SPACING = 5 deg

SLANT RANGE = 6442.7 km, EM ANGLE = 30.9 deg, IN ANGLE = 15.5 deg



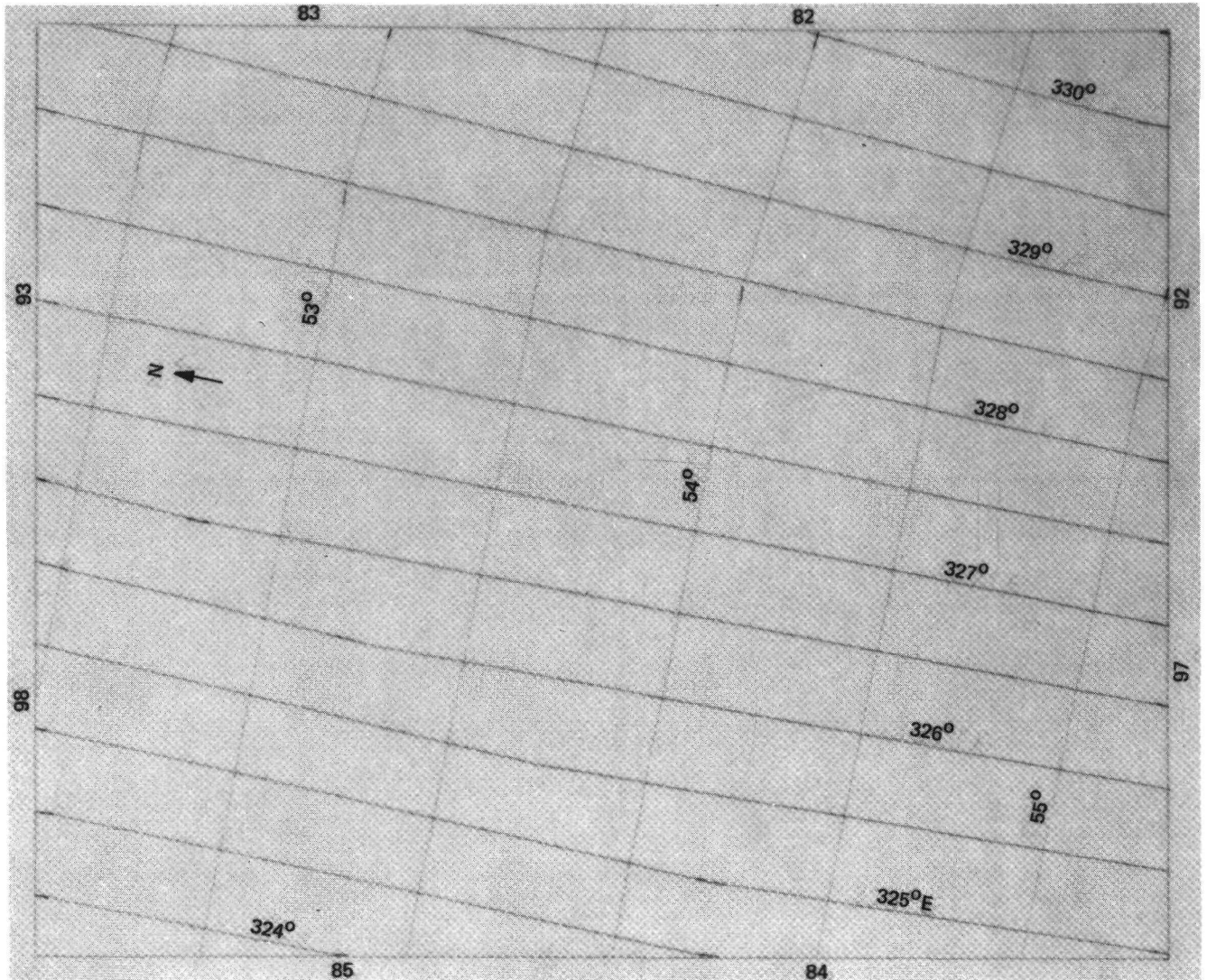
7 NE 10

SHUTTERED E- 14 min 4.6 sec

CONE ANGLE = 144.77 deg, CLOCK ANGLE = 250.96 deg, TWIST ANGLE = 0.06 deg

LAT OF CENTER = -53.7 deg, LONG OF CENTER = 327.2 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 6693.0 km, EM ANGLE = 48.3 deg, IN ANGLE = 51.4 deg



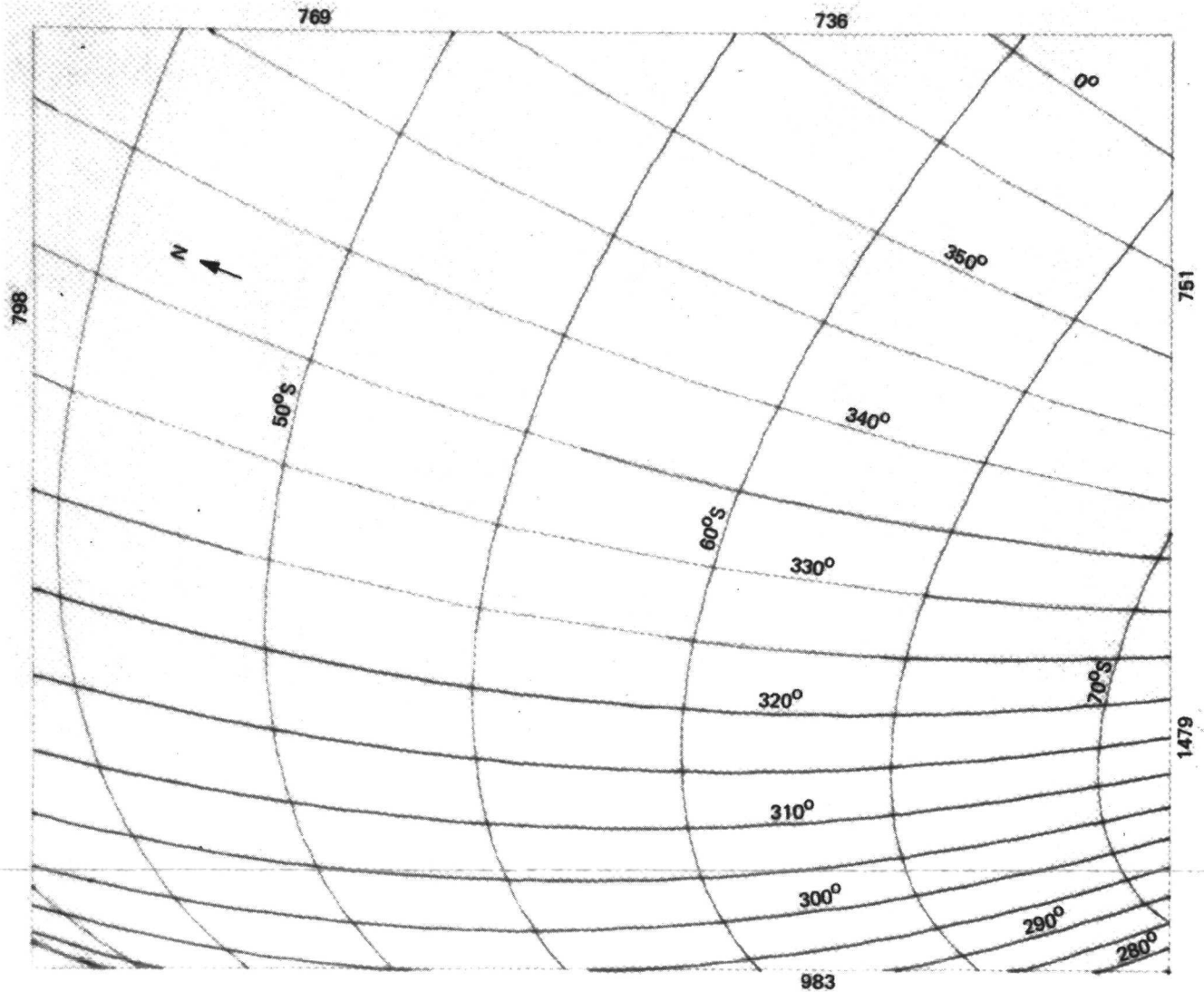
7 NE 11

SHUTTERED E- 13 min 22.3 sec

CONE ANGLE = 144.61 deg, CLOCK ANGLE = 250.41 deg, TWIST ANGLE = -0.61 deg

LAT OF CENTER = -57.2 deg, LONG OF CENTER = 332.6 deg, GRID SPACING = 5 deg

SLANT RANGE = 6381.2 km, EM ANGLE = 45.4 deg, IN ANGLE = 52.2 deg



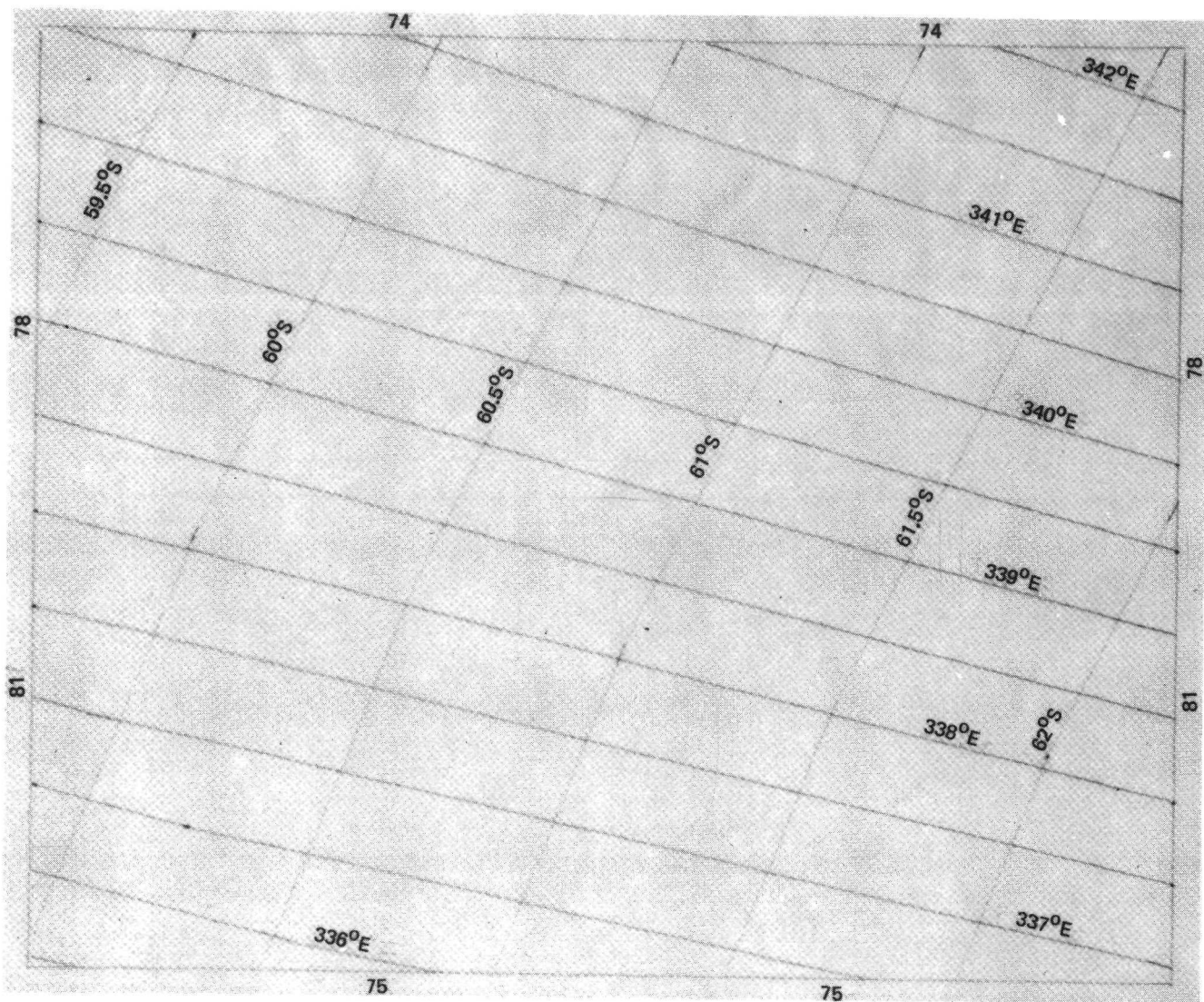
7 NE 12

SHUTTERED E- 12 min 40.1 sec

CONE ANGLE = 144.62 deg, CLOCK ANGLE = 250.49 deg, TWIST ANGLE = -0.50 deg

LATOFCENTER = -60.8 deg, LONG OF CENTER = 338.9 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 6095.0 km, EM ANGLE = 42.9 deg, IN ANGLE = 53.6 deg



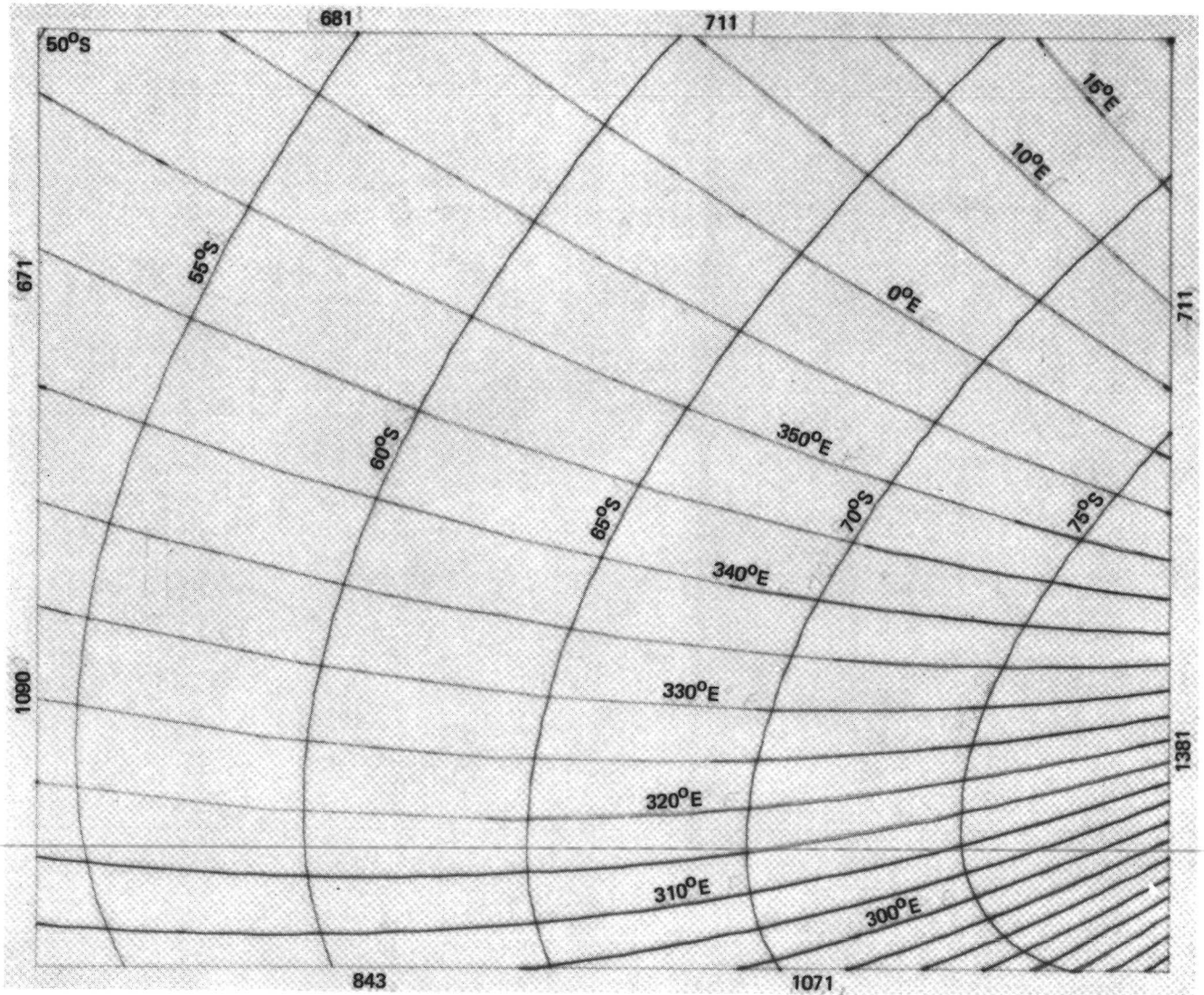
7 NE 13

SHUTTERED E- 11 min 57.8 sec

CONE ANGLE = 144.62 deg, CLOCK ANGLE = 250.69 deg, TWIST ANGLE = -0.26 deg

LAT OF CENTER = -64.6 deg, LONG OF CENTER = 343.4 deg, GRID SPACING = 5 deg

SLANT RANGE = 5886.3 km, EM ANGLE = 42.8 deg, IN ANGLE = 56.4 deg



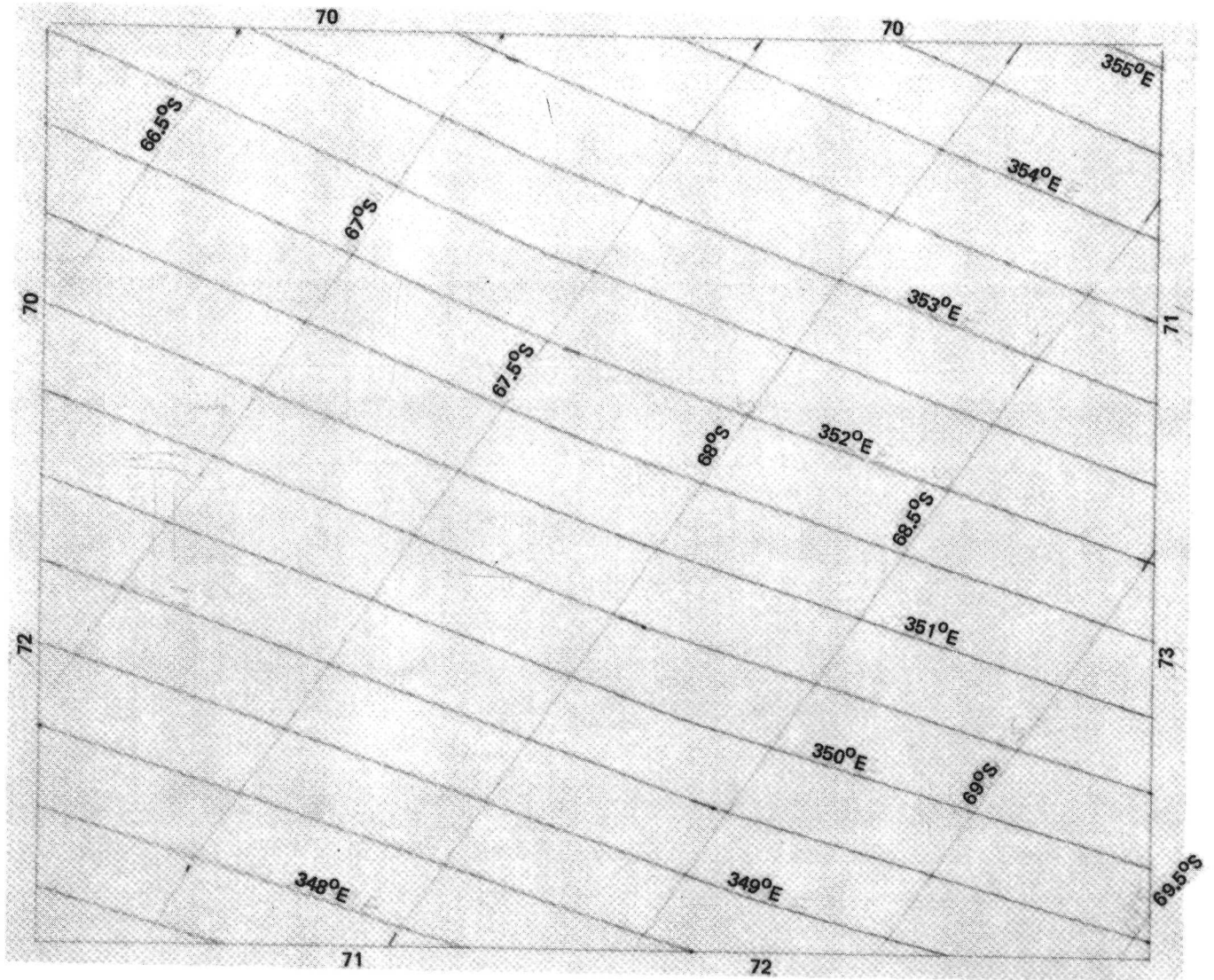
7 NE 14

SHUTTERED E= 11 min 15.6 sec

CONE ANGLE = 144.58 deg, CLOCK ANGLE = 250.86 deg, TWIST ANGLE = -0.05 deg

LAT OF CENTER = -67.8 deg, LONG OF CENTER = 351.2 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 5661.7 km, EM ANGLE = 41.8 deg, IN ANGLE = 58.7 deg



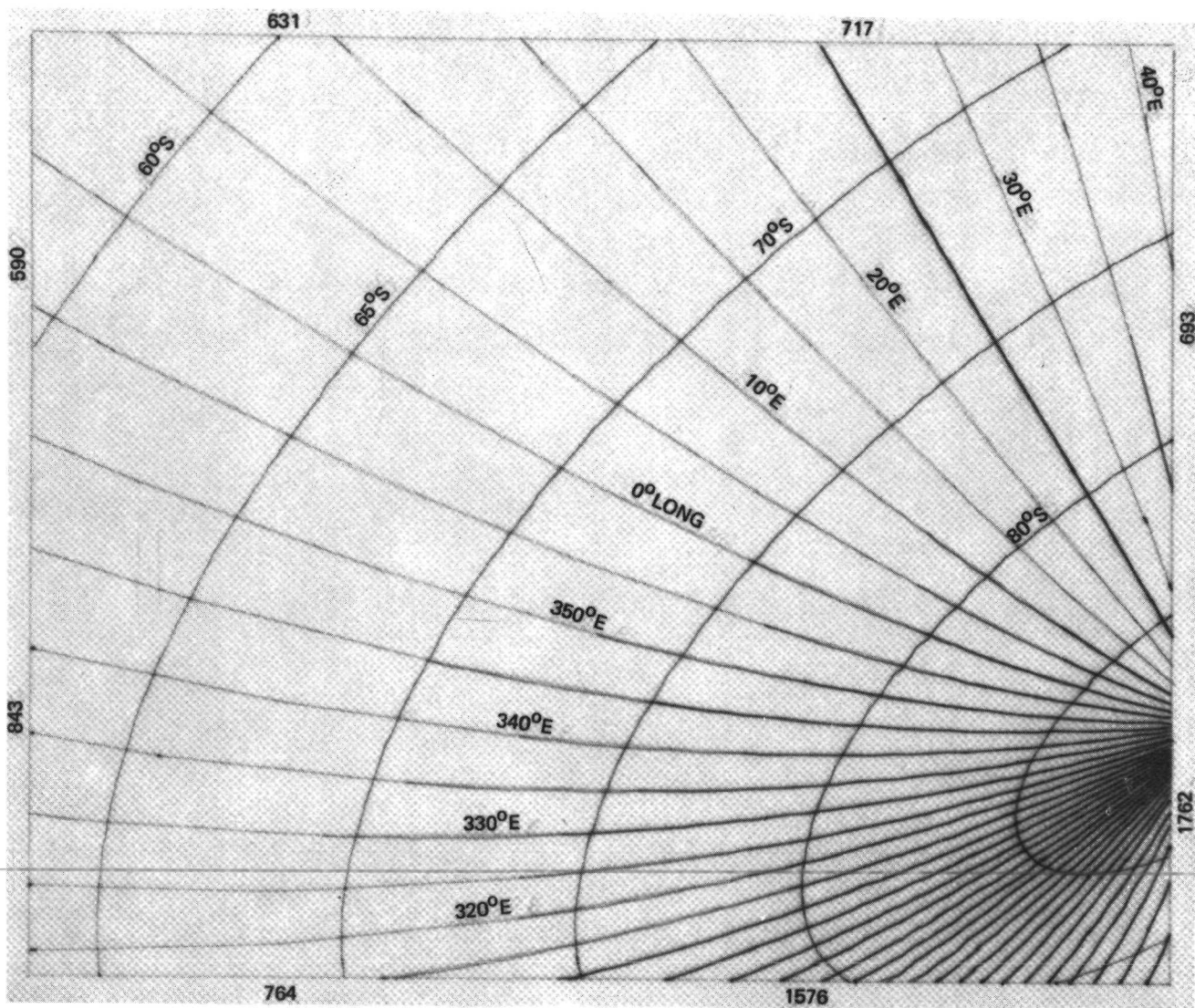
7 NE 15

SHUTTERED E- 10 min 32.3 sec

CONE ANGLE = 144.59 deg, CLOCK ANGLE = 251.01 deg, TWIST ANGLE = 0.12 deg

LAT OF CENTER = -71.4 deg, LONG OF CENTER = 358.8 deg, GRID SPACING = 5 deg

SLANT RANGE = 5495.0 km, EM ANGLE = 42.8 deg, IN ANGLE = 62.1 deg



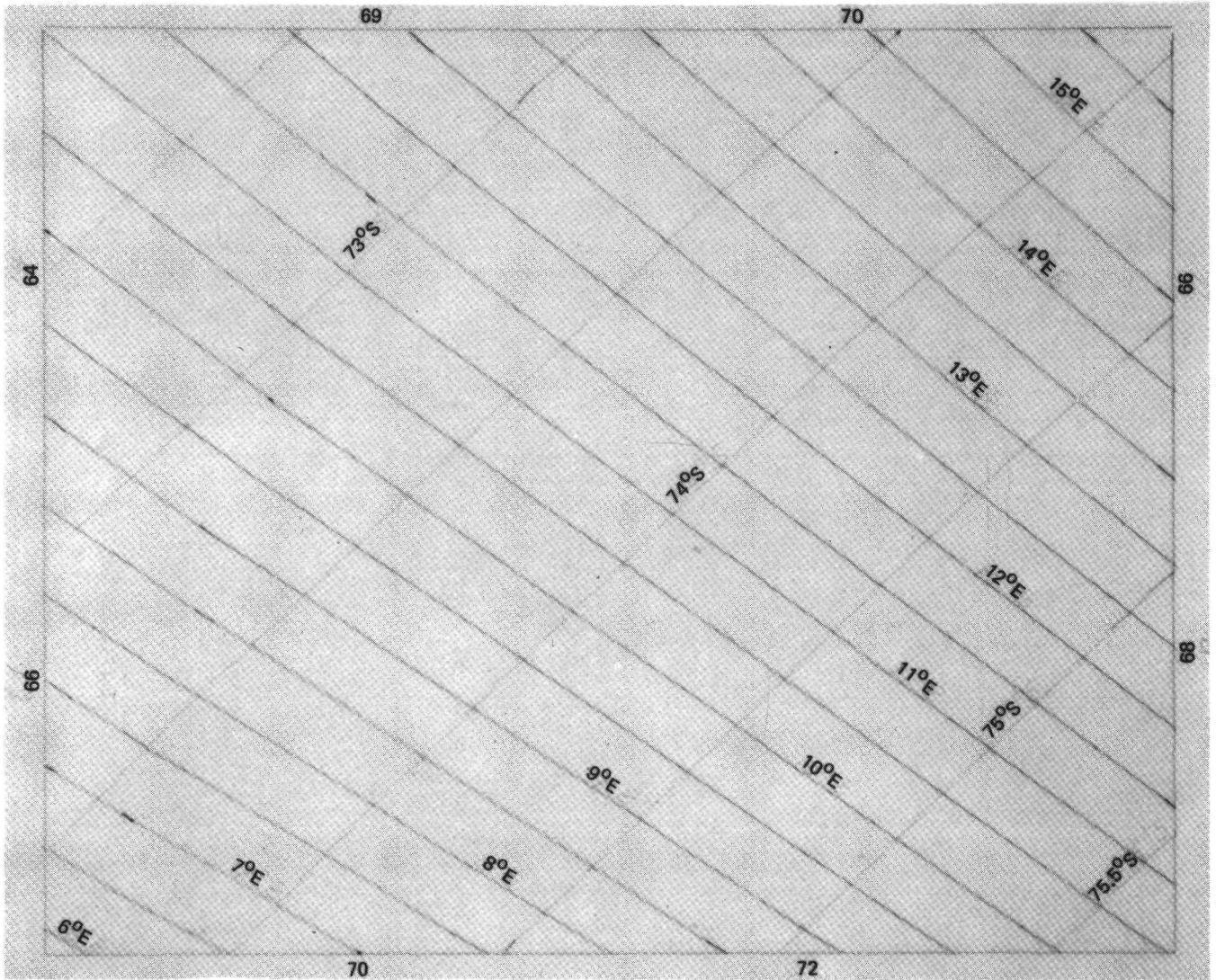
7 NE 16

SHUTTERED E- 9 min 51.2 sec

CONE ANGLE = 144.51 deg, CLOCK ANGLE = 251.01 deg, TWIST ANGLE = 0.13 deg

LAT OF CENTER = -73.8 deg, LONG OF CENTER = 10.9 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 5318.4 km, EM ANGLE = 42.9 deg, IN ANGLE = 64.9 deg



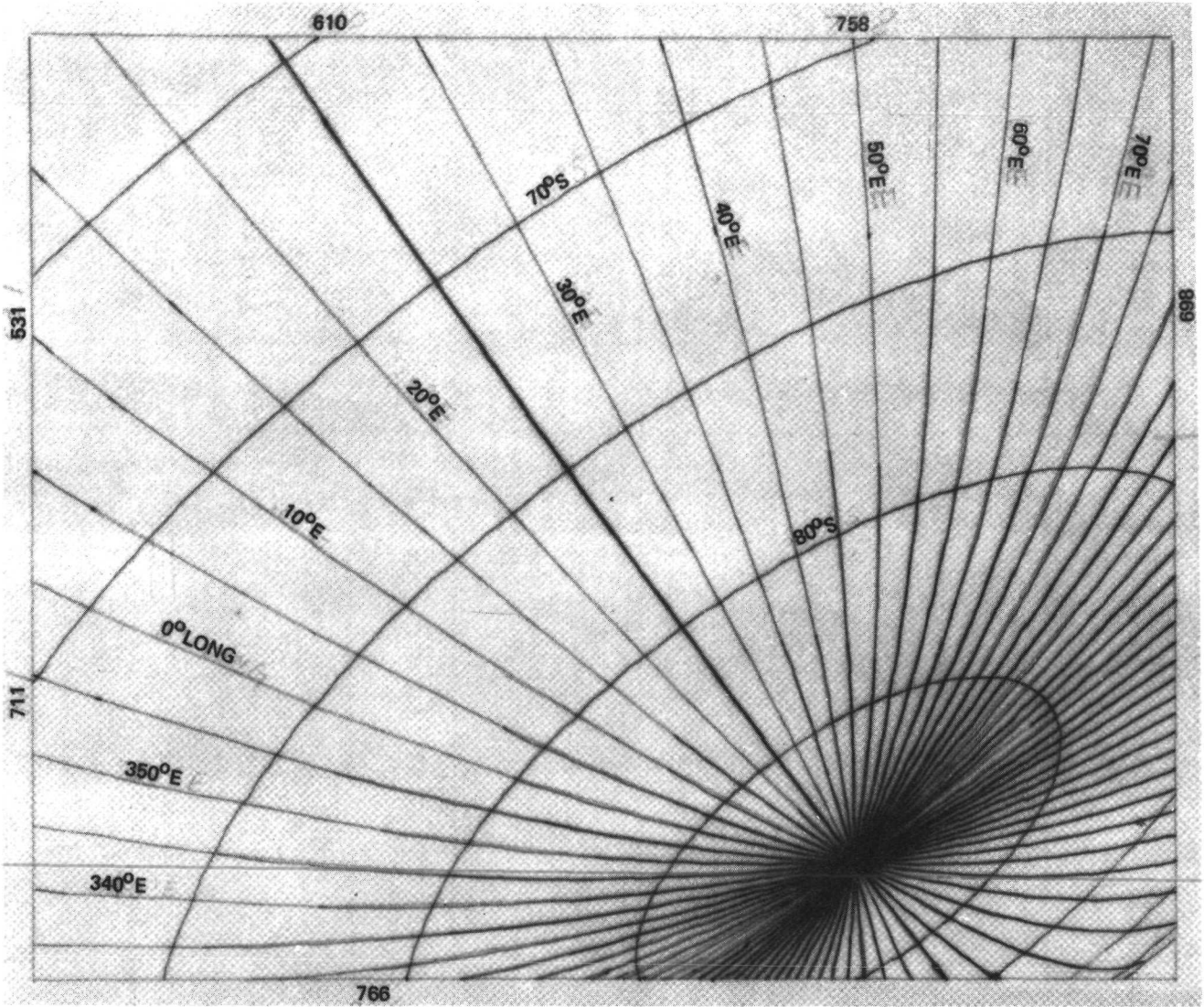
7 NE 17

SHUTTERED E- 9 min 8.9 sec

CONE ANGLE = 144.50 deg, CLOCK ANGLE = 250.89 deg, TWIST ANGLE = -0.02 deg

LAT OF CENTER = -76.4 deg, LONG OF CENTER = 25.5 deg, GRID ANGLE = 5 deg

SLANT RANGE = 5195.0 km, EM ANGLE = 44.7 deg, IN ANGLE = 68.7 deg



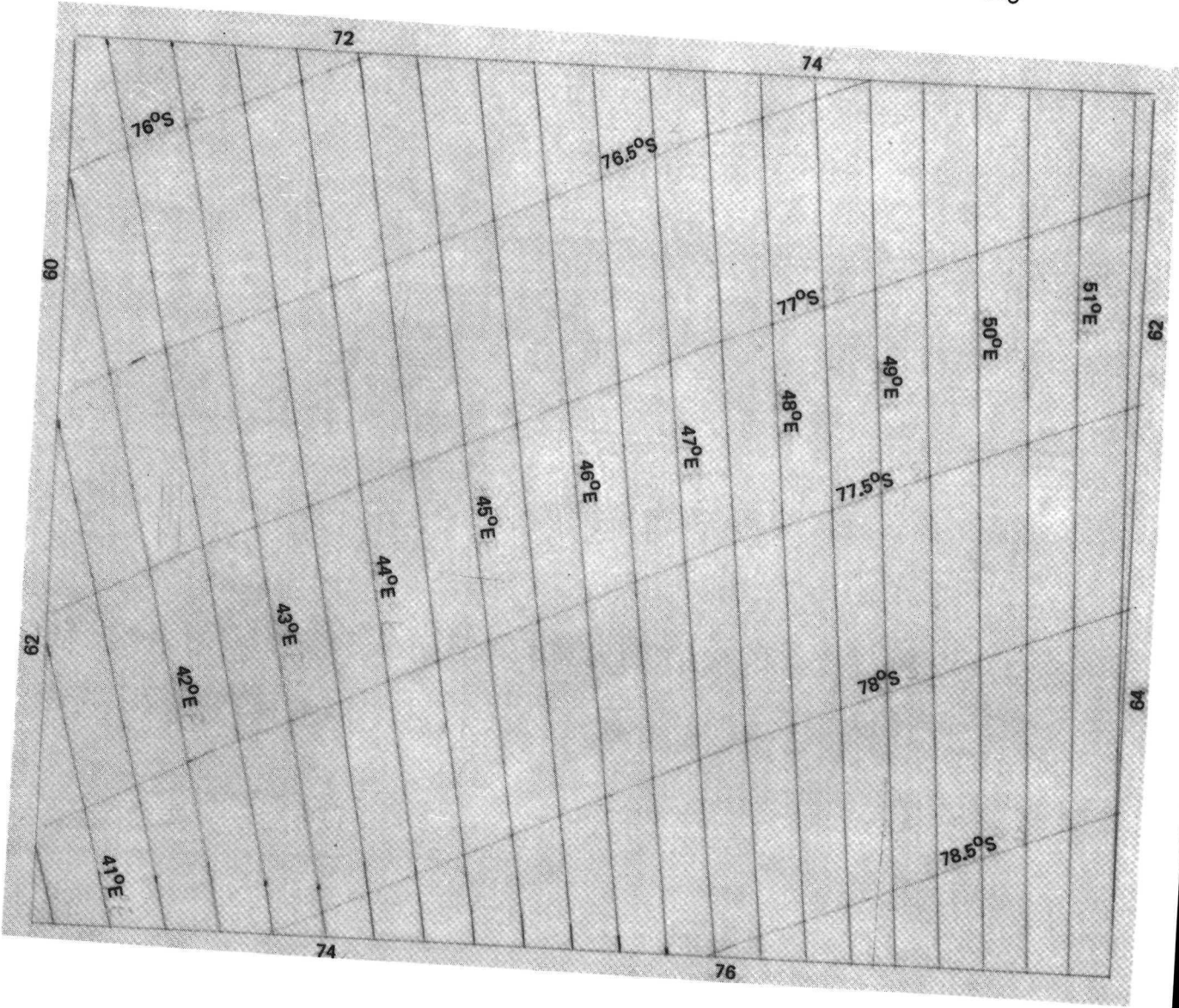
7 NE 18

SHUTTERED E- 8 min 26.7 sec

CONE ANGLE = 144.50 deg, CLOCK ANGLE = 250.73 deg, TWIST ANGLE = 0.21 deg

LAT OF CENTER = -77.3 deg, LONG OF CENTER = 46.1 deg, GRID SPACING = 0.5 deg

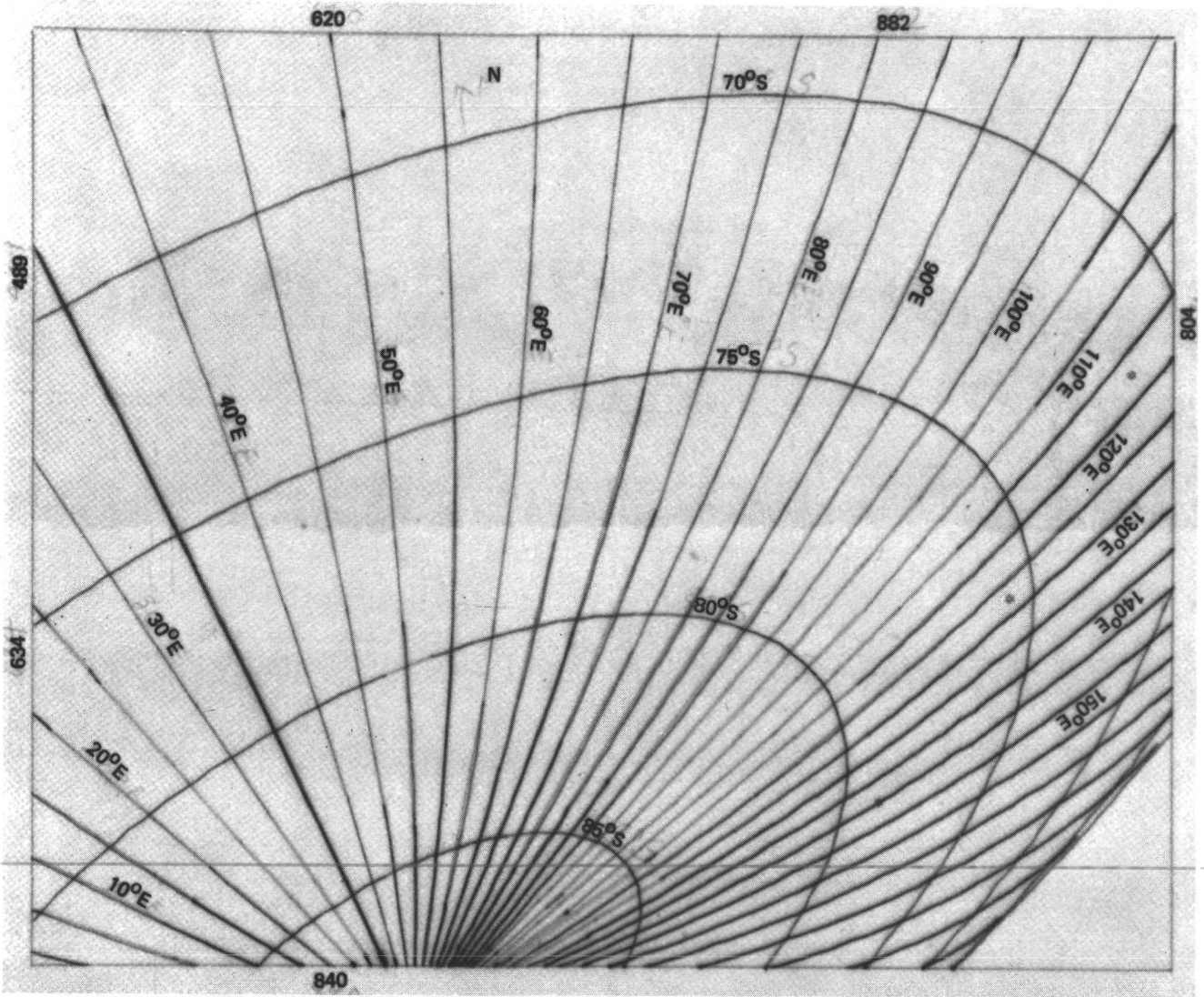
SLANT RANGE = 5069.4 km, EM ANGLE = 46.1 deg, IN ANGLE = 72.4 deg



7 NE 19

SHUTTERED E- 7 min 44.4 sec

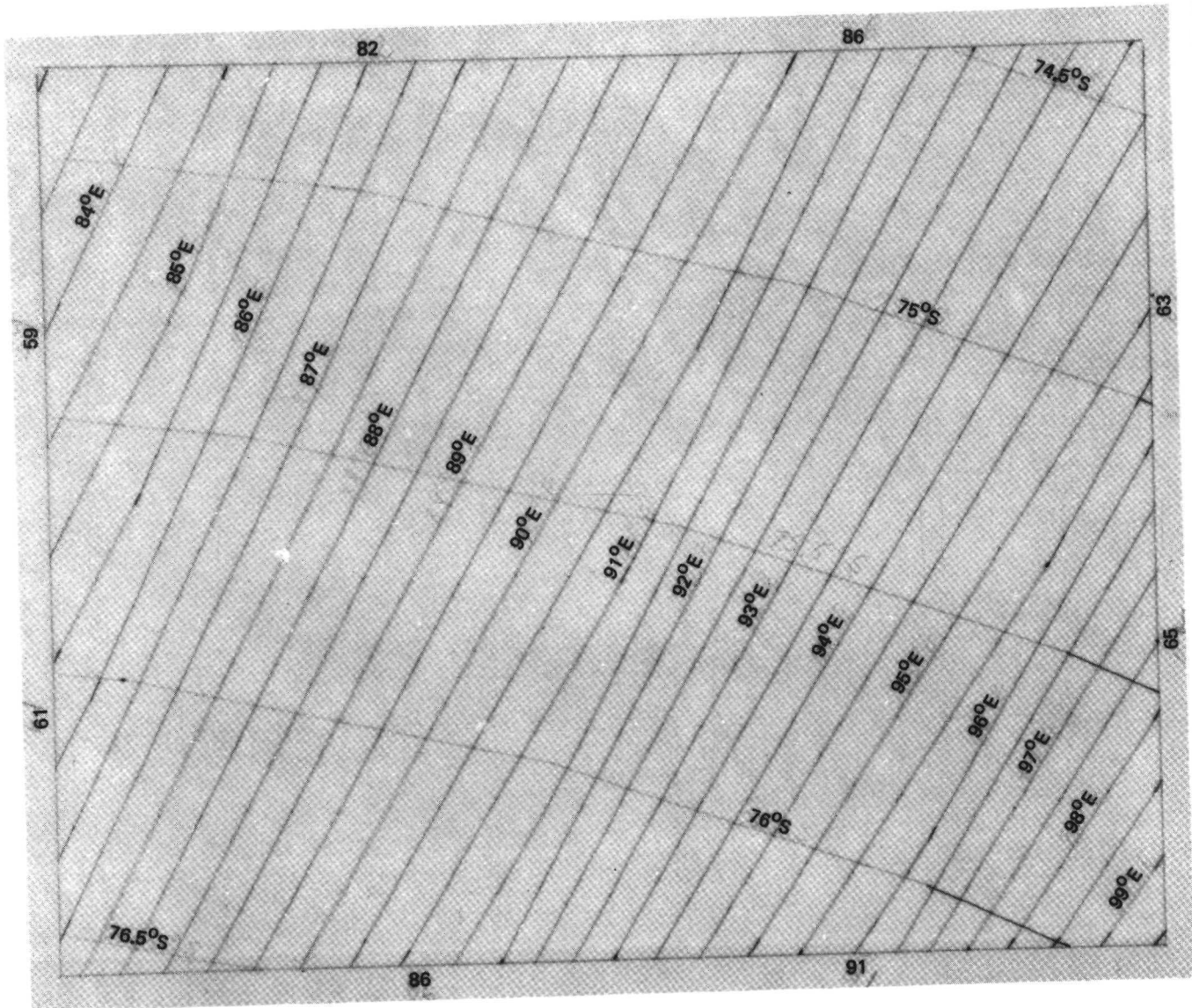
CONE ANGLE = 144.55 deg, CLOCK ANGLE = 250.6 deg, TWIST ANGLE = -0.37 deg
LAT OF CENTER = -77.6 deg, LONG OF CENTER = 69.4 deg, GRID SPACING = 5 deg
SLANT RANGE = 5012.8 km, EM ANGLE = 49.4 deg, IN ANGLE = 77.0 deg



7 NE 20

SHUTTERED E- 7 min 2.2 sec

CONE ANGLE = 144.63 deg, CLOCK ANGLE = 250.50 deg, TWIST ANGLE = -0.5 deg
LAT OF CENTER = -75.5 deg, LONG OF CENTER = 90.8 deg, GRID SPACING = 0.5 deg
SLANT RANGE = 4971.0 km, EM ANGLE = 52.7 deg, IN ANGLE = 81.8 deg



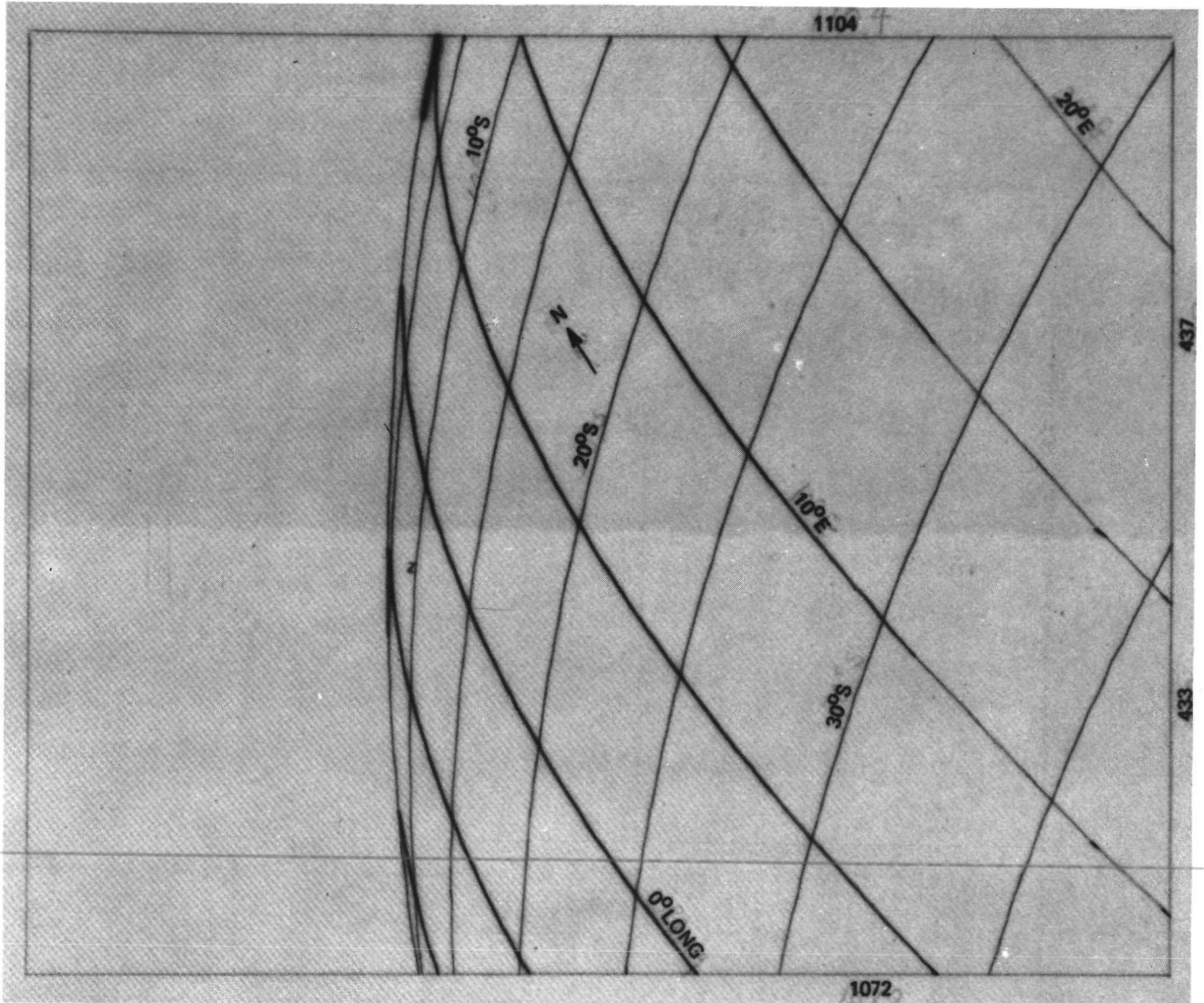
7 NE 21

SHUTTERED E- 6 min 19.9 sec

CONE ANGLE = 100.06 deg, CLOCK ANGLE = 233.71 deg, TWIST ANGLE = 0.06 deg

LAT OF CENTER = -20.7 deg, LONG OF CENTER = 5.9 deg, GRID SPACING = 5 deg

SLANT RANGE = 5337.4 km, EM ANGLE = 65.9 deg, IN ANGLE = 14.0 deg



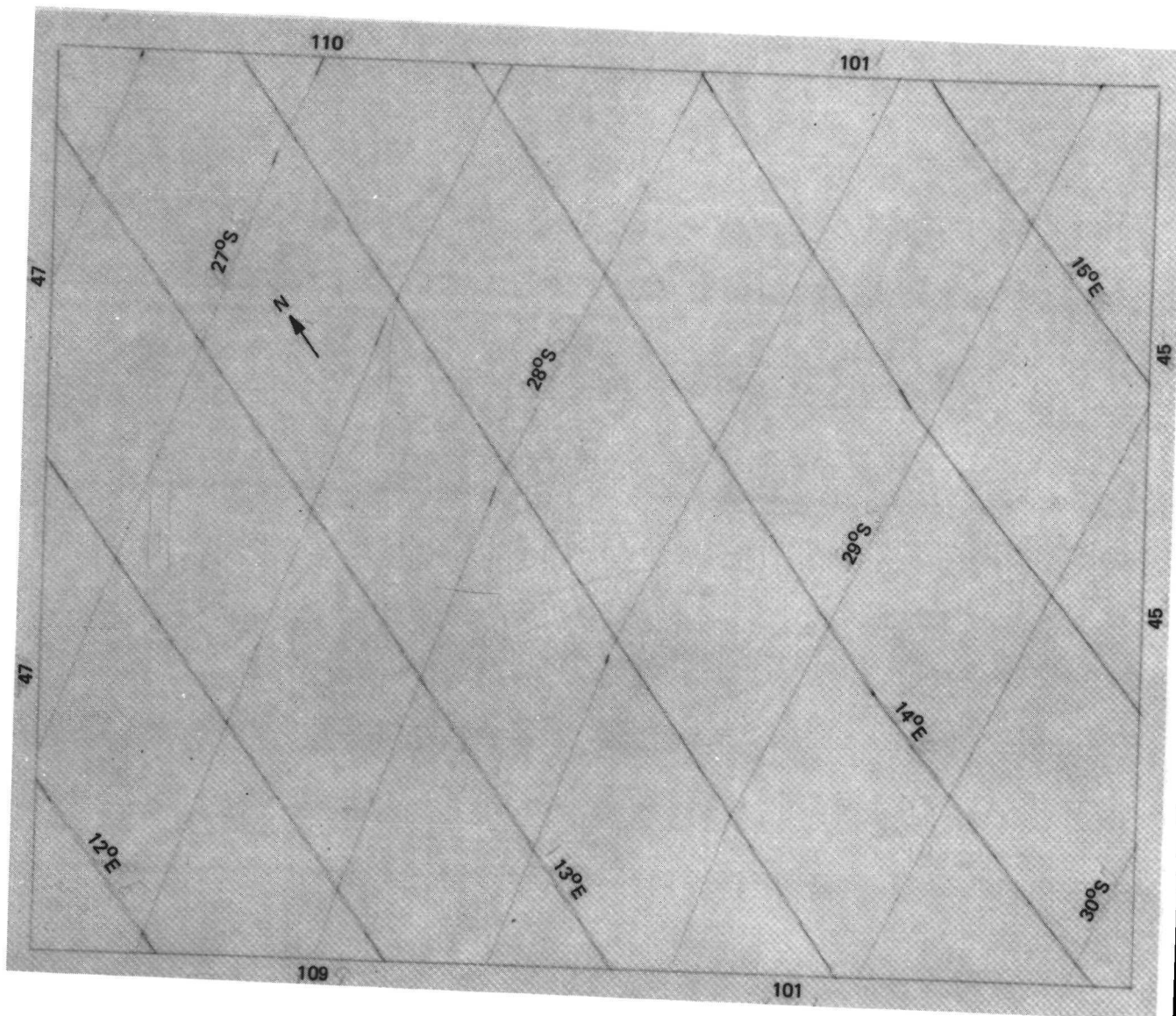
7 NE 22

SHUTTERED E- 5 min 37.7 sec

CONE ANGLE = 99.88 deg, CLOCK ANGLE = 233.75 deg, TWIST ANGLE = 0.27 deg

LAT OF CENTER = -28.3 deg, LONG OF CENTER = 13.7 deg, GRID SPACING = 0.5 deg

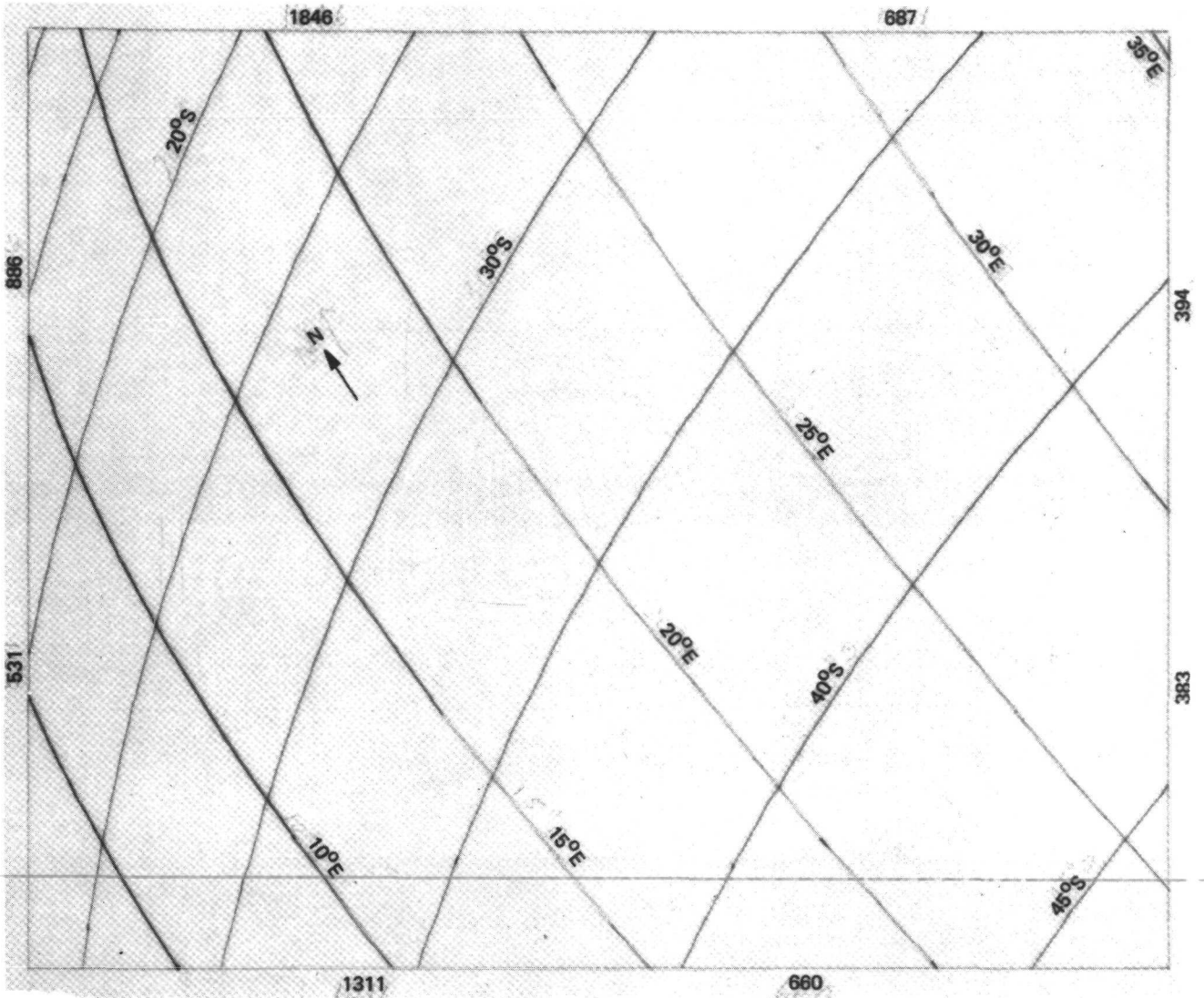
SLANT RANGE = 4817.9 km, EM ANGLE = 55.8 deg, IN ANGLE = 24.4 deg



7 NE 23

SHUTTERED E- 4 min 55.4 sec

CONE ANGLE = 99.96 deg, CLOCK ANGLE = 233.75 deg, TWIST ANGLE = 0.25 deg
LAT OF CENTER = -34.4 deg, LONG OF CENTER = 20.9 deg, GRID SPACING = 5 deg
SLANT RANGE = 4431.1 km, EM ANGLE = 47.2 deg, IN ANGLE = 33.2 deg



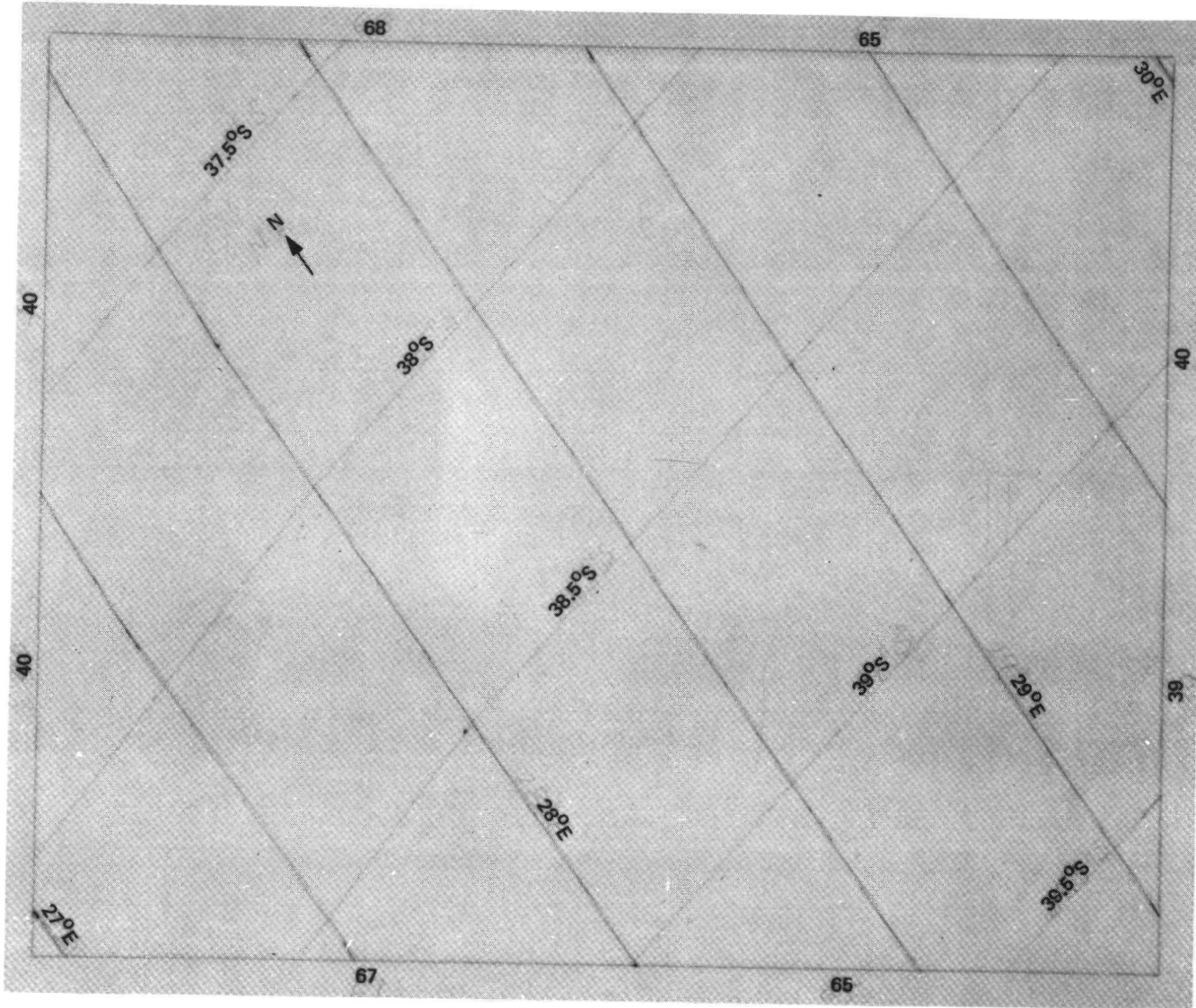
7 NE 24

SHUTTERED E- 4 min 13.2 sec

CONE ANGLE = 99.96 deg, CLOCK ANGLE = 233.74 deg, TWIST ANGLE = 0.20 deg

LAT OF CENTER = -38.5 deg, LONG OF CENTER = 28.5 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 4153.7 km, EM ANGLE = 40.2 deg, IN ANGLE = 40.6 deg



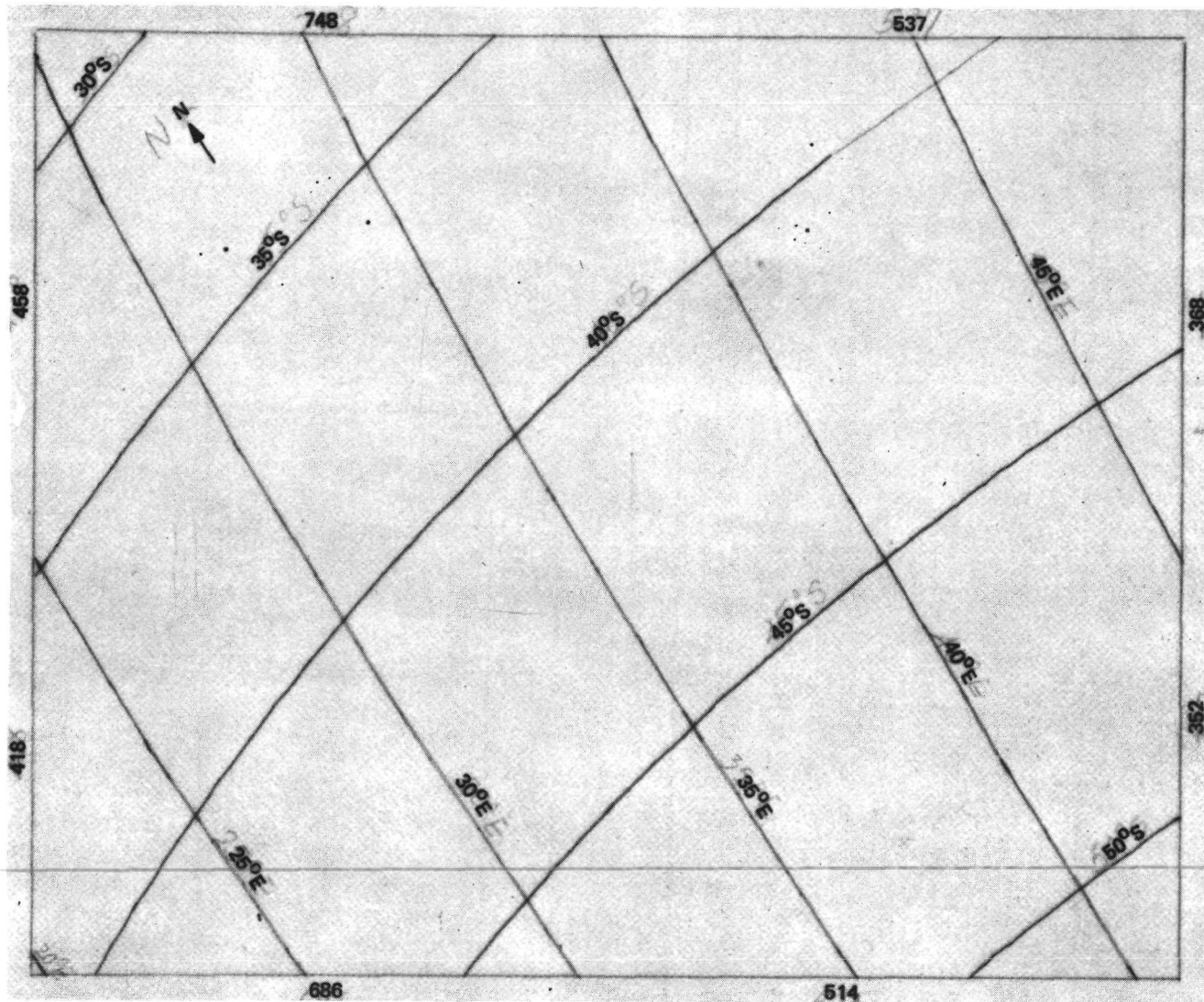
7 NE 25

SHUTTERED E- 3 min 30.95 sec

CONE ANGLE = 99.96 deg, CLOCK ANGLE = 233.74 deg, TWIST ANGLE = 0.20 deg

LAT OF CENTER = -41.8 deg, LONG OF CENTER = 35.9 deg, GRID SPACING = 5 deg

SLANT RANGE = 3938.1 km, EM ANGLE = 33.9 deg, IN ANGLE = 47.2 deg



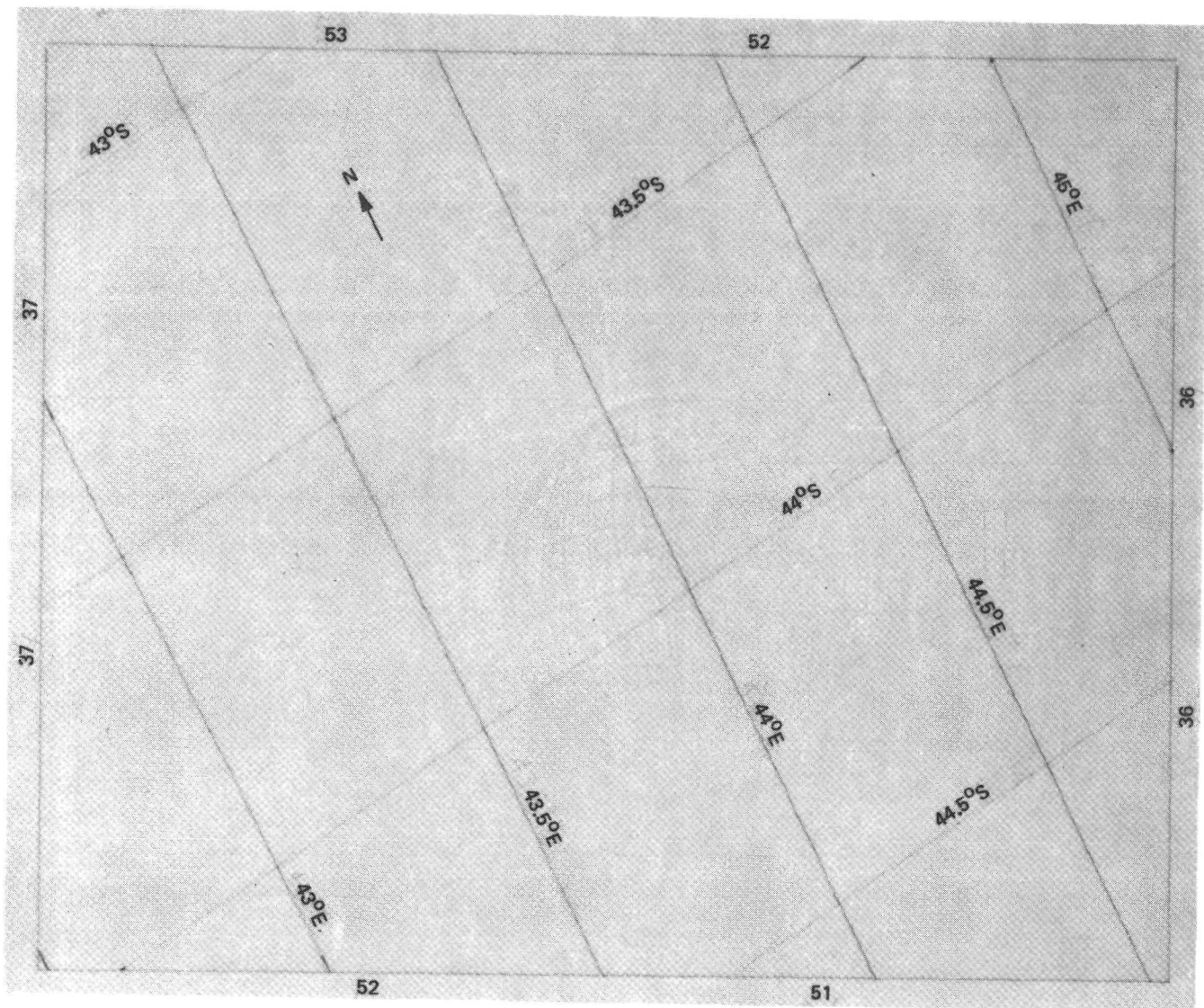
7 NE 26

SHUTTERED E- 2 min 48.8 sec

CONE ANGLE = 99.96 deg, CLOCK ANGLE = 233.74 deg, TWIST ANGLE = 0.20 deg

LAT OF CENTER = -43.9 deg, LONG OF CENTER = 43.9 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 3778.3 km, EM ANGLE = 28.6 deg, IN ANGLE = 53.5 deg



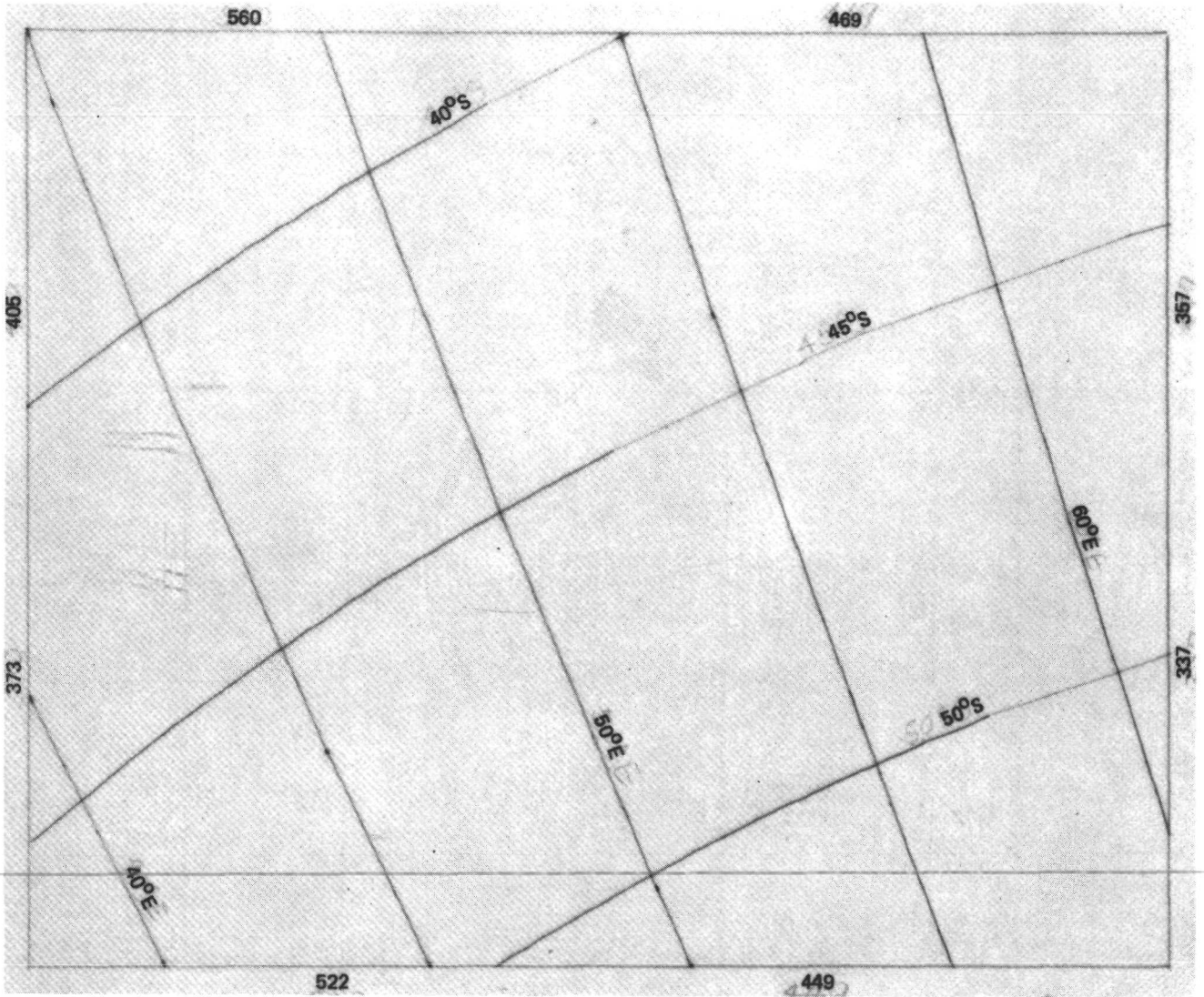
7 NE 27

SHUTTERED E- 2 min 6.5 sec

CONE ANGLE = 99.96 deg, CLOCK ANGLE = 233.74 deg, TWIST ANGLE = 0.20 deg

LAT OF CENTER = -45.5 deg, LONG OF CENTER = 51.8 deg, GRID SPACING = 5 deg

SLANT RANGE = 3656.1 km, EM ANGLE = 23.7 deg, IN ANGLE = 59.4 deg



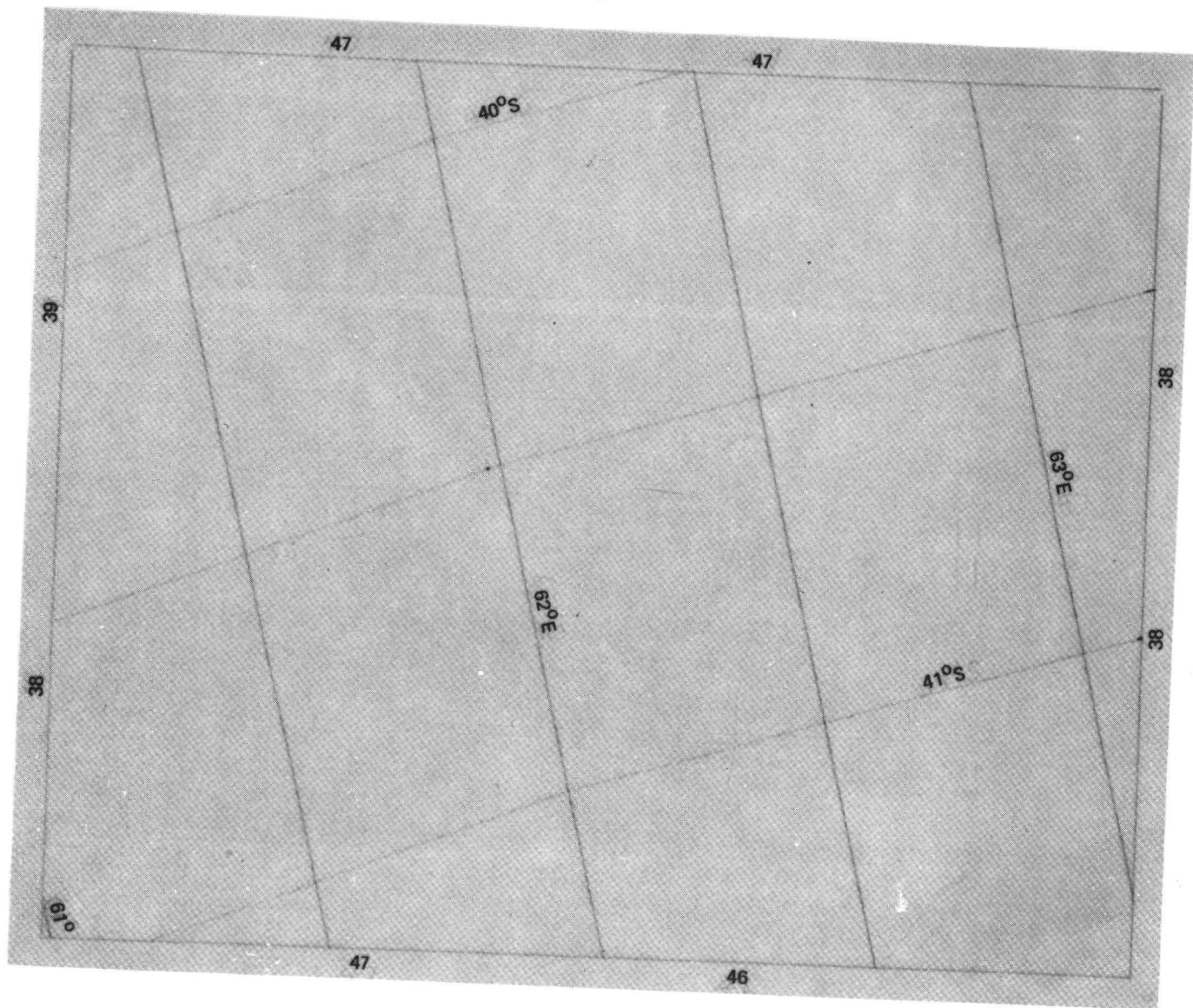
7 NE 28

SHUTTERED E- 1 min 24.3 sec

CONE ANGLE = 100.14 deg, CLOCK ANGLE = 228.80 deg, TWIST ANGLE = 0.00 deg

LAT OF CENTER = -40.6 deg, LONG OF CENTER = 62.2 deg, GRID SPACING = 0.5 deg

SLANT RANGE = 3678.9 km, EM ANGLE = 28.0 deg, IN ANGLE = 65.7 deg



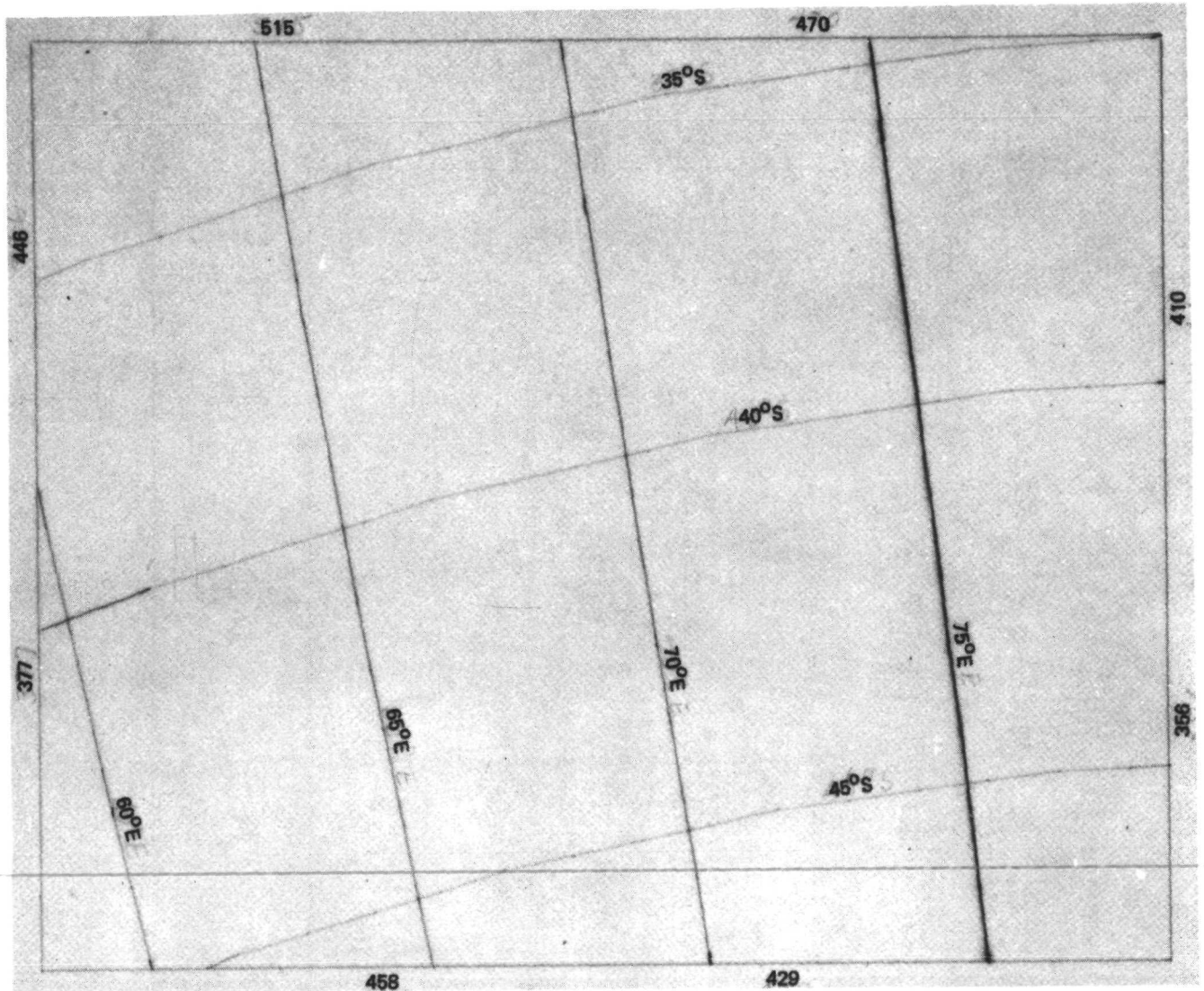
7 NE 29

SHUTTERED E- 0 min 42.0 sec

CONE ANGLE = 100.21 deg, CLOCK ANGLE = 228.82 deg, TWIST ANGLE = 0.08 deg

LAT OF CENTER = -40.6 deg, LONG OF CENTER = 69.5 deg, GRID SPACING = 5 deg

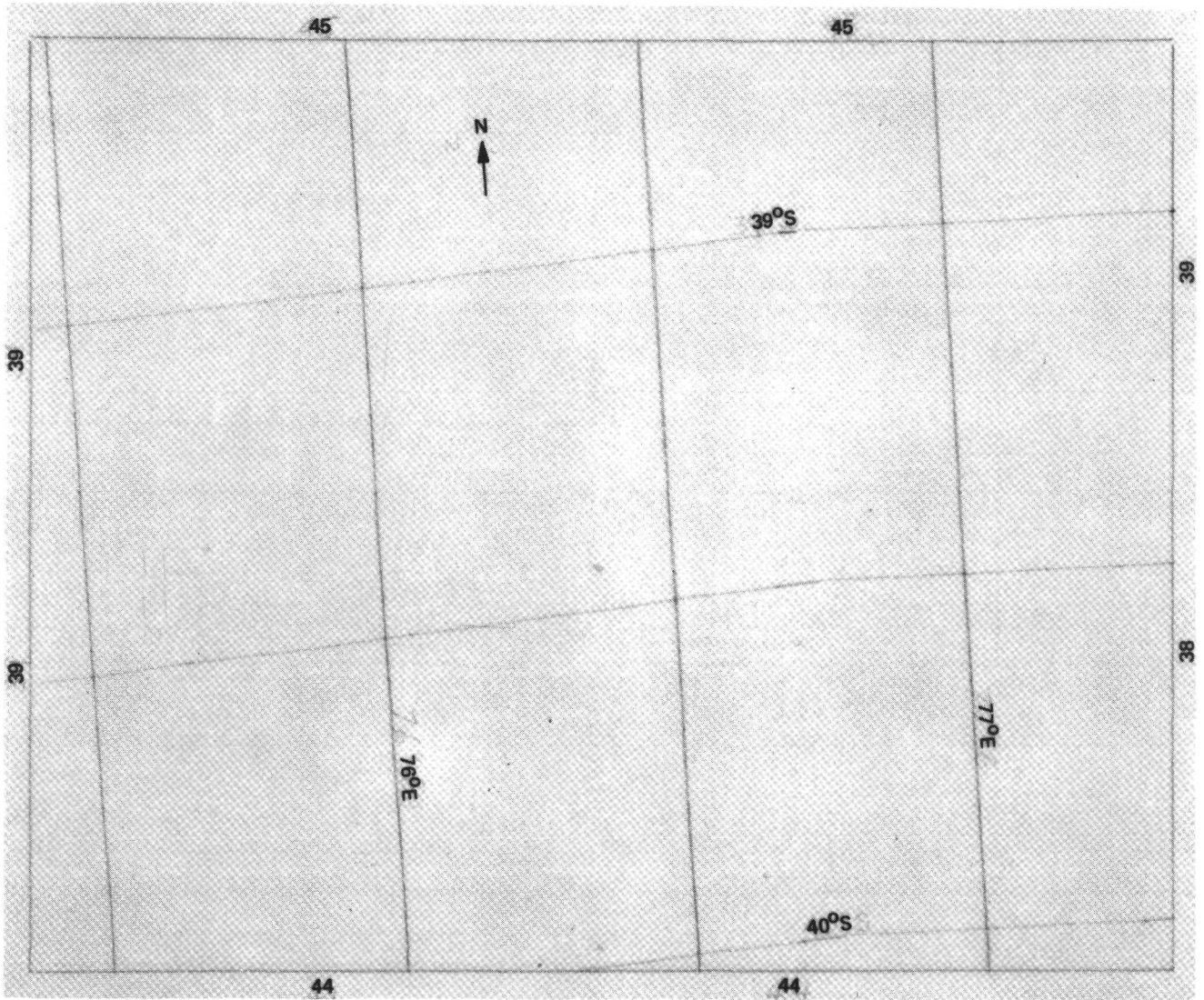
SLANT RANGE = 3632.6 km, EM ANGLE = 26.4 deg, IN ANGLE = 71.3 deg



7 NE 30

SHUTTERED E+0 min 0.21 sec

CONE ANGLE = 100.10 deg, CLOCK ANGLE = 228.84 deg, TWIST ANGLE = 0.23 deg
LAT OF CENTER = -39.4 deg, LONG OF CENTER = 76.4 deg, GRID SPACING = 0.5 deg
SLANT RANGE = 3635.6 km, EM ANGLE = 27.1 deg, IN ANGLE = 76.7 deg



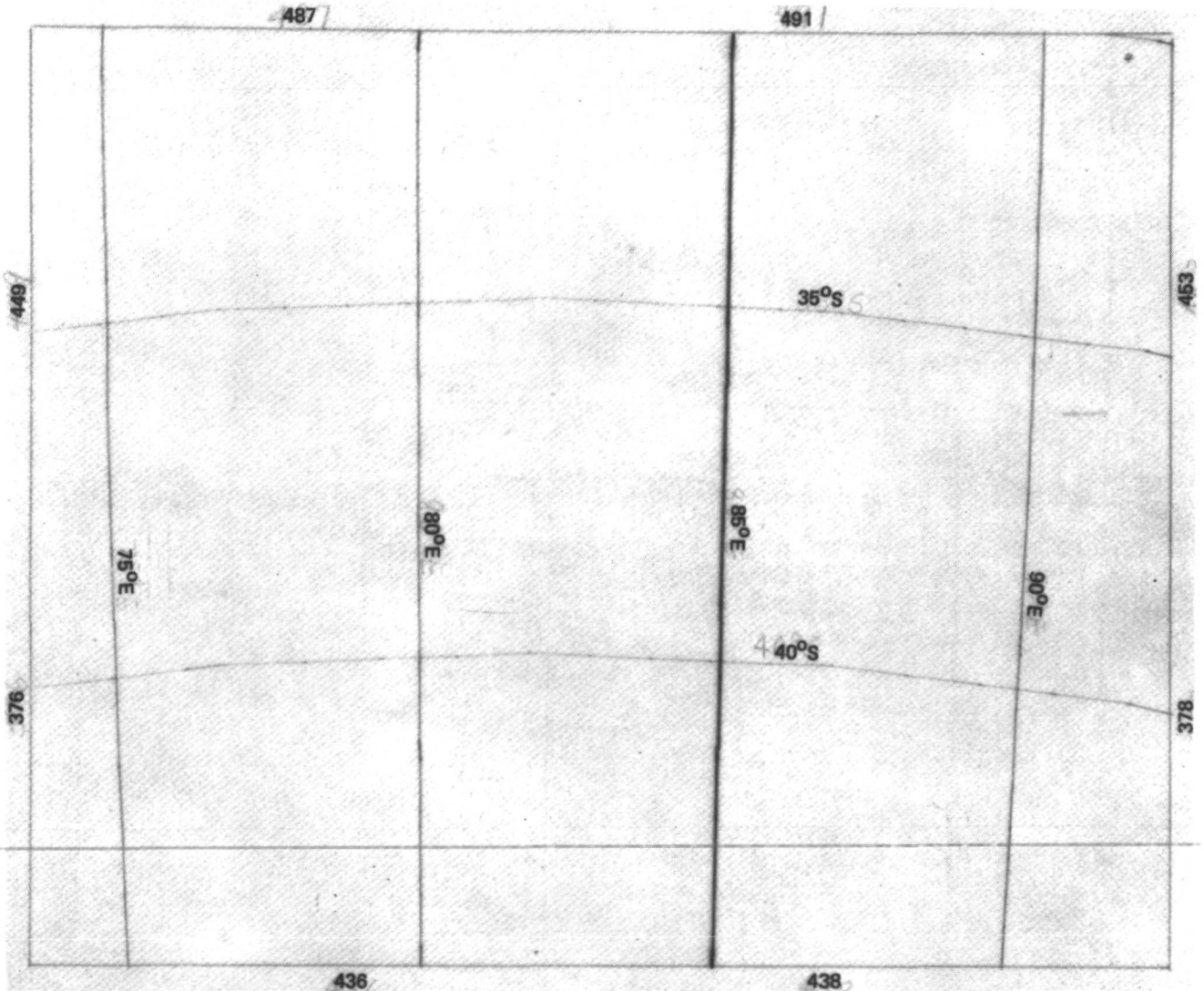
7 NE 31

SHUTTERED E+0 min 42.5 sec

CONE ANGLE = 99.98 deg, CLOCK ANGLE = 228.84 deg, TWIST ANGLE = 0.22 deg

LAT OF CENTER = -37.9 deg, LONG OF CENTER = 83.0 deg, GRID SPACING = 5 deg

SLANT RANGE = 3659.7 km, EM ANGLE = 28.2 deg, IN ANGLE = 82.1 deg



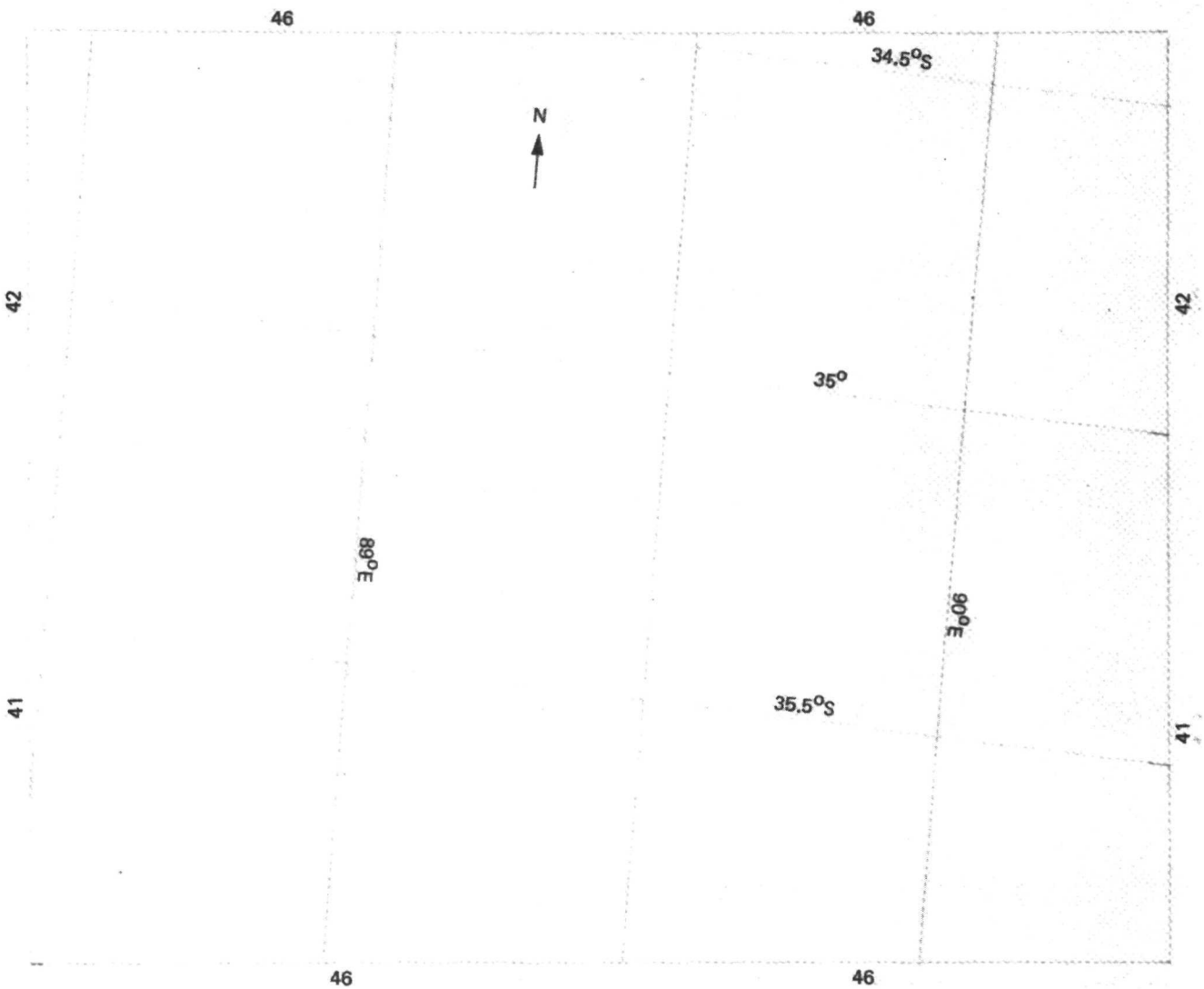
7 NE 32

SHUTTERED E+ 1 min 24.7 sec

CONE ANGLE = 99.98 deg, CLOCK ANGLE = 228.84 deg, TWIST ANGLE = 0.22 deg

LAT OF CENTER = -35.2 deg, LONG OF CENTER = 89.4 deg, GRID SPACING = 5 deg

SLANT RANGE = 3734.7 km, EM ANGLE = 31.4 deg, IN ANGLE = 87.7 deg



7 NE 33

SHUTTERED E+ 2 min 7.0 sec

CONE ANGLE = 99.98 deg, CLOCK ANGLE = 228.84 deg, TWIST ANGLE = 0.22 deg

LAT OF CENTER = -32.4 deg, LONG OF CENTER = 95.4 deg, GRID SPACING = 5 deg

SLANT RANGE = 3833.3 km, EM ANGLE = 34.7 deg, IN ANGLE = 93.3 deg

