U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared for the
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NOTES ON BASE

This map is one in a series covering the entire surface of Mars at a nominal scale of 1:5,000,000. The series was originally compiled from Mariner 9 data (Batson and others, 1979). The original shaded relief base was revised and augmented with image data from Viking Orbiter, but feature positions were not shifted to fit controls derived from Viking.

ADOPTED FIGURE

The figure of Mars used for the computation of the map projection is an oblate spheroid (flattening of 1/192) with an equatorial radius of 3,393.4 km and a polar radius of 3,375.7 km.

PROJECTION

The Mercator, Lambert Conformal Conic, and Polar Stereographic projections are used for this map series. The scale of the series is 1:5,000,000 at the equator. The projections have common scales of 1:4,336,000 at lat ±30° and 1:4,306,000 at lat ±65°. Standard parallels for the Lambert Conformal Conic projection are at lat ±35.8° and ±59.2°. Longitude increases to the west in accordance with astronomical convention for Mars. Latitude is planetographic.

CONTROL

Planimetric control of the shaded relief is provided by photogrammetric triangulation using Mariner 9 images (Davies, 1973; Davies and Arthur, 1973) and the radio-tracked position of the Mariner 9 spacecraft. The first meridian passes through the center of a small crater, Airy-O (lat 5.19° S., long 0°), within the crater Airy.

Primary controls used in the network include the Viking Orbiter Secondary Experiment Data Record, radio-occultation measurements from both Mariner 9 and Viking Missions (Lorell and others, 1972; Kliore and others, 1973; Lindal and others, 1979), Earth-based radar observations (Pettengill and others, 1971; Downs and others, 1975), and the Mars primary control network of the Rand Corporation (Davies and others, 1978).

MAPPING TECHNIQUE

Shaded relief was portrayed by photointerpretive methods described by Inge and Bridges (1976). Uniform sun illumination from the west was used throughout. The original rendition of feature positions, sizes, and shapes was taken from a controlled base mosaic of Mariner 9 images. Various computer enhancements of many Mariner 9 and Viking Orbiter images besides those in the base mosaic were examined in an attempt to portray the surface as accurately as possible.

Initial shaded relief analysis and representation based on Viking Orbiter data were made by Patricia M. Bridges; revisions were made by Barbara J. Hall.

COLOR

No attempt was made on the map to duplicate precisely the color of the martian surface, although the color used may approximate it.

NOMENCLATURE

Names on this sheet are approved by the International Astronomical Union (IAU, 1974, 1977, 1986, 1990, 1992).

MC–1: Abbreviation for Mars Chart 1.

M 5M 90/0 RN: Abbreviation for Mars; 1:5,000,000 series; center of sheet, lat 90° N., long 0°; shaded relief map (R) with nomenclature (N).

REFERENCES

Batson, R.M., Bridges, P.M., and Inge, J.L., 1979, Atlas of Mars—The 1:5,000,000 map series: National Aeronautics and Space Administration Special Publication 438, 146 p.

Davies, M.E., 1973, Mariner 9—Primary control net: Photogrammetric Engineering, v. 39, no. 12, p. 1297–1302.

Davies, M.E., and Arthur, D.W.G., 1973, Martian surface coordinates: Journal of Geophysical Research, v. 78, no. 20, p. 4355–4394.

Davies, M.E., Katayama, F.Y., and Roth, J.A., 1978, Control net of Mars: February 1987: The Rand Corporation, R–2309–NASA, 91 p.

Downs, G.S., Reichley, P.E., and Green, R.R., 1975, Radar measurements of martian topography and surface properties: Icarus, v. 26, no. 3, p. 273–312.

Inge, J.L., and Bridges, P.M., 1976, Applied photointerpretation for airbrush cartography: Photogrammetric Engineering and Remote Sensing, v. 42, no. 6, p. 749–760.

International Astronomical Union, 1974, Commission 16: Physical study of planets and satellites *and* Lunar and martian nomenclature, *in* Proceedings of the 15th General Assembly, Sydney, 1973: Transactions of the International Astronomical Union, v. 15B, p. 105–108, 207–221.

——1977, Working Group for Planetary System Nomenclature, *in* Proceedings of the 16th General Assembly, Grenoble, 1976: Transactions of the International Astronomical Union, v. 16B, p. 321–325, 331–336, 355–362.

——1986, Working Group for Planetary System Nomenclature, *in* Proceedings of the 19th General Assembly, New Delhi, 1985: Transactions of the International Astronomical Union, v. 19B, p. 339–353.

——1990, Working Group for Planetary System Nomenclature, *in* Proceedings of the 20th General Assembly, Baltimore, 1988: Transactions of the International Astronomical Union, v. 20B, p. 369–372.

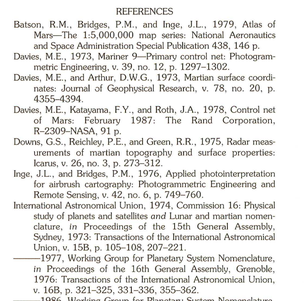
——1992, Working Group for Planetary System Nomenclature, *in* Proceedings of the 21st General Assembly, Buenos Aires, 1991: Transactions of the International Astronomical Union, v. 21B, p. 357–363.

Kliore, A.J., Fjeldbo, Gunnar, Seidel, B.L., Sykes, M.J., and Woiceshyn, P.M., 1973, S-band radio occultation measurements of the atmosphere and topography of Mars with Mariner 9: Extended mission coverage of polar and intermediate latitudes: Journal of Geophysical Research, v. 78, no. 20, p. 4331–4351.

Lindal, G.F., Hotz, H.B., Sweetnam, D.N., Shippony, Zvi, Brenkle, J.P., Hartsell, G.V., and Spear, R.T., 1979, Viking radio occultation measurements of the atmosphere and topography of Mars: Journal of Geophysical Research, v. 84, no. B14, p. 8443–8456.

Lorell, Jack, Born, G.H., Jordan, J.F., Laing, P.A., Martin, W.L., Sjogren, W.J., Shapiro, I.I., Reasenberg, R.D., and Slater, G.L., 1972, Mariner 9 celestial mechanics experiment—Gravity field and pole direction of Mars: Science, v. 175, no. 4019, p. 317–320.

Pettengill, G.H., Rogers, A.E.E., and Shapiro, I.I., 1971, Martian craters and a scarp as seen by radar: Science, v. 174, no. 4016, p. 1321–1324.



A-camera pictures

Index No.	DAS No.
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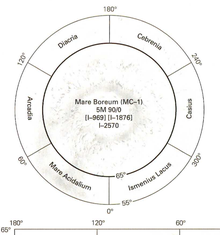
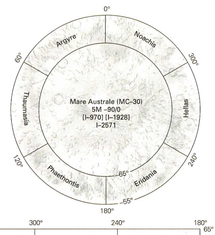
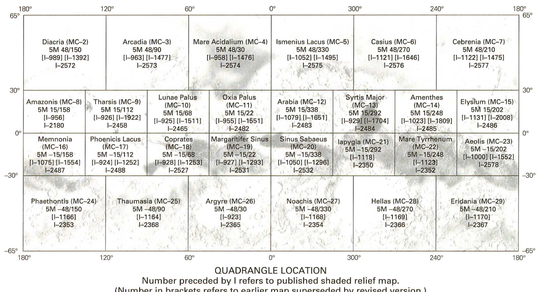
2	8011603
3	12328406
4	11800011
5	11800151
6	11977149
7	12502275
8	11452114
9	11622910
10	13028127
11	11622770
12	11858750
13	11481974
14	11836131
15	11858890
16	11446134
17	12538255
18	12364456
19	12013129
20	11835991
21	12364316
22	12188797
23	12012889
24	12153097

INDEX OF MARINER 9 PICTURES

The mosaic used to control the positioning of features on this map was made with the Mariner 9 A-camera pictures outlined above. The DAS number may vary slightly (usually by 5) among different versions of the same picture.





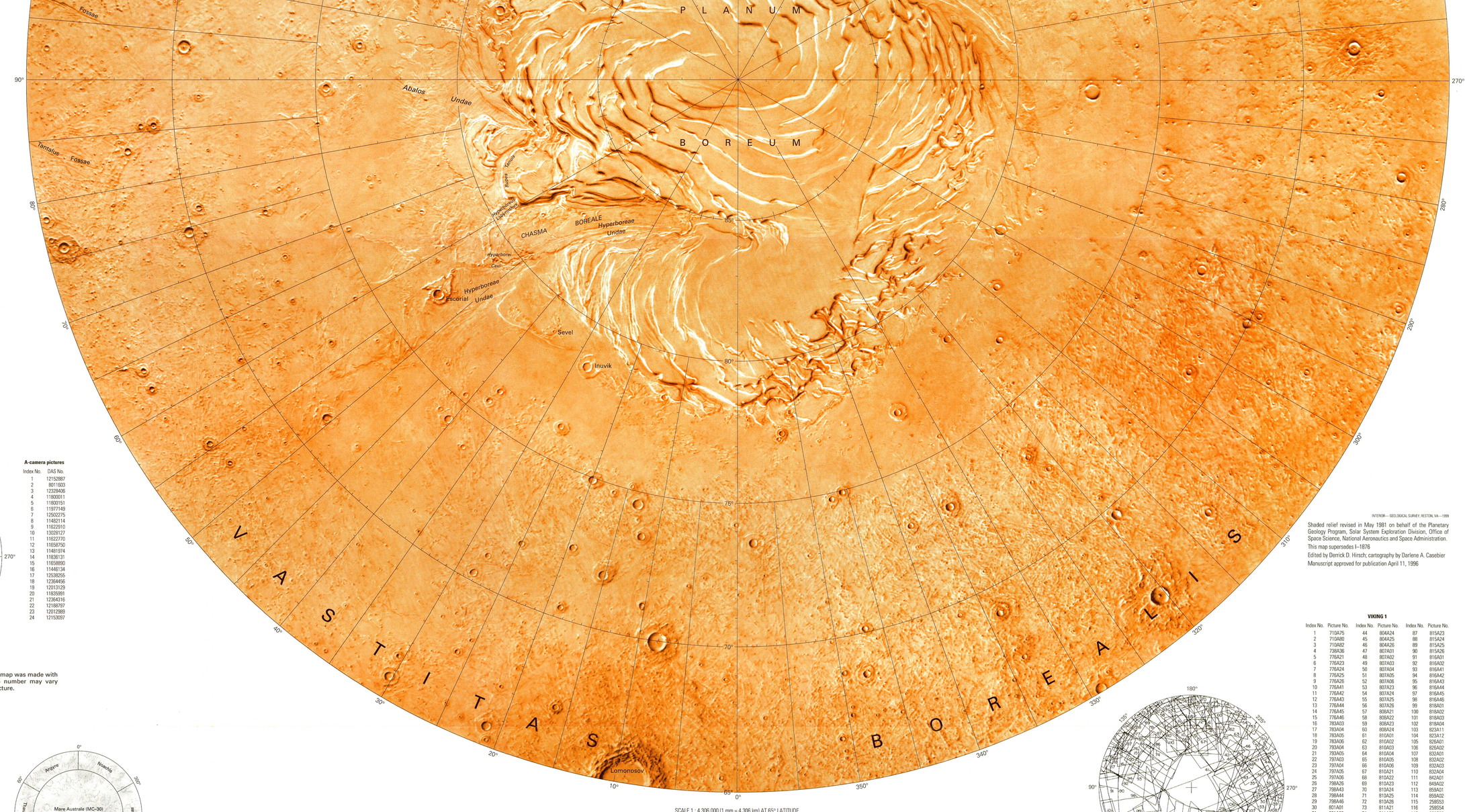


QUADRANGLE LOCATION

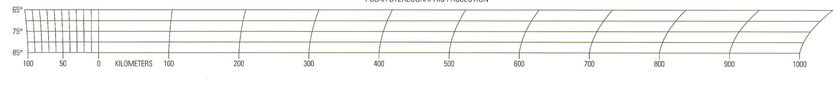
Number preceded by I refers to published shaded relief map.
(Number in brackets refers to earlier map superseded by revised version.)

NOTE TO USERS

Users noting errors or omissions are urged to indicate them on the map and to forward it to U.S. Geological Survey, Building 4, Room 454, 2255 North Gemini Drive, Flagstaff, Arizona 86001. A replacement copy will be returned.



SCALE 1 : 4 306 000 (1 mm = 4.306 km) AT 65° LATITUDE
POLAR STEREOGRAPHIC PROJECTION



INTERIOR—GEOLOGICAL SURVEY, RESTON, VA—1999

Shaded relief revised in May 1981 on behalf of the Planetary Geology Program, Solar System Exploration Division, Office of Space Science, National Aeronautics and Space Administration.

This map supersedes I–1876

Edited by Derrick D. Hirsch; cartography by Darlene A. Casebier

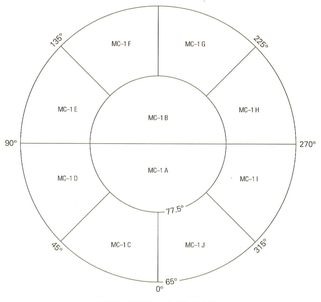
Manuscript approved for publication April 11, 1996

VIKING 1

Index No.	Picture No.	Index No.	Picture No.	Index No.	Picture No.
1	710A75	44	804A24	87	815A22
2	710A80	45	804A25	88	815A24
3	710A82	46	804A26	89	815A25
4	738A36	47	807A01	90	815A26
5	776A21	48	807A02	91	816A01
6	776A23	49	807A03	92	816A02
7	776A24	50	807A04	93	816A41
8	776A25	51	807A05	94	816A42
9	776A26	52	807A06	95	816A43
10	776A41	53	807A23	96	816A44
11	776A42	54	807A24	97	816A45
12	776A43	55	807A25	98	816A46
13	776A44	56	807A26	99	818A01
14	776A45	57	808A21	100	818A02
15	776A46	58	808A22	101	818A03
16	783A03	59	808A23	102	818A04
17	783A04	60	808A24	103	823A11
18	783A05	61	810A01	104	823A12
19	783A06	62	810A02	105	826A01
20	793A04	63	810A03	106	826A02
21	793A05	64	810A04	107	832A01
22	797A03	65	810A05	108	832A02
23	797A04	66	810A06	109	832A03
24	797A05	67	810A21	110	832A04
25	797A06	68	810A22	111	842A01
26	798A29	69	810A23	112	849A02
27	798A43	70	810A24	113	859A01
28	798A44	71	810A25	114	859A02
29	798A46	72	810A26	115	259S53
30	801A01	73	811A21	116	259S54
31	801A03	74	811A22	117	259S55
32	801A04	75	814A21	118	259S56
33	801A05	76	814A22	119	259S57
34	801A06	77	814A23	120	259S58
35	801A46	78	814A24	121	258S59
36	804A01	79	815A01	122	259S60
37	804A03	80	815A02	123	259S61
38	804A04	81	815A03	124	259S62
39	804A05	82	815A04	125	259S63
40	804A06	83	815A05	126	259S64
41	804A21	84	815A06	127	259S65
42	804A22	85	815A21	128	259S66
43	804A23	86	815A22		

1:2,000,000-SCALE CONTROLLED PHOTOMOSAICS

I–Series	Quadrangle
I–1703	MC–1 A & B
I–1667	MC–1 C
I–1668	MC–1 D
I–1669	MC–1 E
I–1670	MC–1 F
I–1671	MC–1 G
I–1672	MC–1 H
I–1673	MC–1 I
I–1674	MC–1 J



INDEX OF VIKING SOURCES

This shaded relief map has been revised by utilizing 1:2,000,000-scale controlled photomosaics and supplementary Viking pictures outlined above. Copies of various enhancements of these pictures are available from National Space Science Data Center, Code 601, Goddard Space Flight Center, Greenbelt, MD 20771.

For sale by U.S. Geological Survey, Information Services, Box 25286, Federal Center, Denver, CO 80225

REVISED SHADED RELIEF MAP OF THE MARE BOREUM REGION (MC–1) OF MARS

1999

ISBN 0-607-93228-7