

NOTES ON BASE

This is one map in a set of topographic maps sheets covering areas of special interest on Mars at nominal scales of 1:1,000,000 and 1:250,000 (Blasco, 1973). The major source of map data was the Mariner 9 television experiment (Marsovis and others, 1970).

ADOPTED FIGURE

The figure of Mars used for the construction of the map projection is an oblate spheroid (flattening of 1/192) with an equatorial radius of 3393.4 km and a polar radius of 3375.7 km.

PROJECTION

The transverse Mercator projection is used for this sheet, with a scale of 1:1,000,000 at 25° longitude. Longitudes increase to the west in accordance with usage of the International Astronomical Union (IAU, 1971). Latitudes are according to the Van der Grinten projection.

CONTROL

Planimetric control is provided by photogrammetric triangulation using Mariner 9 pictures (Bates, 1973; Davies and Arthur, 1973) and by radio-located positions of the crater Arias 04 at 23° 57' S within the crater Arias. No simple triangulation is possible for the region, but local consistency is 2 km.

MAPPING TECHNIQUE

A series of mosaics of Mariner 9 photographs of Mars were assembled at 1:5,000,000. Shaded relief was copied from the mosaics and portrayed with uniform illumination with the sun to the west. Many Mariner 9 pictures besides those in the base mosaic were examined to improve the portrayal of local features and to provide photographic reliability (figs. 1-2).

Shaded relief analysis and representation were made by Jay L. Iger.

ALBEDO MARKINGS

The markings represented on the shaded relief were copied from pictures that were computer-enhanced especially to show low-frequency tone variation (Bates and Iger, 1976). The surface in these pictures is illuminated from a variety of angles from the camera line of sight. The markings therefore delineate boundaries of local brightness variations, and should not be considered as a true measure of albedo. No attempt was made to use Earth-based telescope albedo data.

CONTOURS

Since Mars has no sea and hence no sea level, the datum (0 km contour line for altitudes) is defined by a gravity field described by spherical harmonics of fourth order and fourth degree (Lorenz and Lorenz, 1973) combined with a 6.1 millibar atmospheric pressure surface derived from radio-sonde data (Klose and others, 1973; Christensen, 1973). This datum is fitted to the topographic data of the 378.6 km by 3393.3 km, and a semi-minor axis of 3376.3 km. The semi-major axis A intersects the Martian surface at long 105°.

The contour lines (Wu, 1975) were compiled from Earth-based radar determinations (Thorne and others, 1971; Pettengill and others, 1971) and measurements made by Mariner 9 instrumentation, including the altimeter (Pettengill and others, 1974), infrared interferometer spectrometer (Carruth and others, 1973), and stereoscopic Mariner 9 television pictures (Wu and others, 1973).

Formal analysis of contour-line accuracy has not been made. The estimated vertical accuracy of each source of data indicates a probable error of 1.2 km.

COLOR

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

NOMENCLATURE

All names on this sheet are provisional, except for the following which are approved by the International Astronomical Union (IAU, 1974): Mithras, northern hemisphere; Nardor, southern hemisphere; Sannar Vallis, Ladaon Vallis, Nardor Vallis, and Nardor Fossa, southern hemisphere. Named craters bearing double or triple letters in parentheses are designated by the same letters on the 1:5,000,000 Mariner 9 mosaic sheet which covers this area. The prefix MAR identifies the Mariner 9 mosaic sheet in part of the complete designation, but, for brevity, is not shown on most sheets.

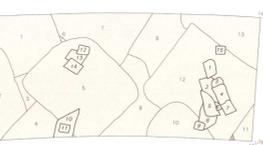
ABBREVIATIONS

M 1M-24/26 RMC Abbreviation for Mars, 1:1,000,000 series, center of sheet, 24° S latitude, 26° longitude, shaded relief map, R, with albido markings, M, and contours, C.

REFERENCES

Bates, R. M., 1973, Colorgraphic products from the Mariner 9 camera. *Jour. Geophys. Research*, v. 78, no. 20, p. 4432-4435.
Bates, R. M., and Iger, J. L., 1976, Albedo boundaries on Mars in 1972. Results from Mariner 9. *Jour. Geophys. Research*, v. 81, no. 20, p. 2999-2912.
Christensen, J. J., 1973, Martian topography derived from occultation, radar, spectral, and optical measurements. *Jour. Geophys. Research*, v. 78, no. 20, p. 2999-2912.
Carruth, J. F., Carruth, R. K., Hanel, R. A., Kinsler, V. G., Kinsler, R. W., Poff, J. C., Pirtle, J., Walker, J., and Burke, T., 1973, Atmospheric and surface properties of Mars obtained by infrared spectroscopy on Mariner 9. *Jour. Geophys. Research*, v. 78, no. 20, p. 4267-4278.
Davies, M. E., and Arthur, D. W. G., 1973, Primary contour-line photographs. *Jour. Geophys. Research*, v. 78, no. 20, p. 4335-4394.
Davies, M. E., Goldstein, R. M., Green, R. R., and Morris, G. A., 1973, Mars radar observations, a preliminary report. *Science*, v. 174, no. 4016, p. 1324-1327.
Hend, C. W., Nason, R. K., and McLaughlin, L. K., 1974, Mariner 9 altimeter spectrometer experiment: Pressure altitude measurements on Mars. *Jour. Geophys. Research*, v. 79, no. 21, p. 392-392.
Iger, J. L., 1972, Principles of tone illumination. *Aeronaut. Chart and Map. Center Ref. Pub. RP72-1*, 60 p.

International Astronomical Union, Commission 16, 1971, Physical study of planets and satellites, at Proc. 14th General Assembly, 1970. *Internat. Astron. Union Trans.*, v. XIV, p. 128-137.
—, 1974, Physical study of planets and satellites, at Proc. 15th General Assembly, 1973. *Internat. Astron. Union Trans.*, v. XV, p. 105-108.
Jovan, J. J., and Lovell, Jack, 1973, Mariner 9: an instrument of dynamical science. Presented at AAS/AMA Astro-Dynamics Conf., Vol. Colo., July 16-18, 1973.
Klose, A. J., Fildes, Gunter, Soder, R. L., Sykes, M. F., and Wozniak, P. M., 1973, Sound radio occultation measurements of the atmosphere and topography of Mars with Mariner 9. Extended mission coverage of polar and intertropical latitudes. *Jour. Geophys. Research*, v. 78, no. 20, p. 4331-4351.
Lorenz, R. C., Green, W. B., Curtis, A., Jabelka, J. D., Johnson, R. A., Sander, M. J., Seelman, J. B., Young, A. T., and Soderstrom, L. A., 1973, Mariner 9: image processing and products. *Jour. Geophys. Research*, v. 78, no. 20, p. 4351-4351.
Marsden, Harold, Bates, R. M., Burrows, T. L., Carr, M. H., McCarty, J. L., Milton, B. J., Wiles, R. L., Williams, D. E., Murray, B. C., Harrison, A. H., Leitch, R. R., Sharp, R. V., Thompson, J. W., Rizzo, G. A., Chameysson, P., Shroyer, L. S., Aguiar, Carl, Peltier, J. A., Lindbergh, Joshua, Erdos, J. C., Hartmann, W. K., McCord, T. R., Smith, R. A., Burns, M. L., and Vasouliou, G. D., and 1971, *Jour. Geophys. Research*, v. 76, no. 1, p. 10-45.
Pettengill, G. H., Rogers, A. J., and Shapiro, J. L., 1971, Martian curves and a survey as seen by radar. *Science*, v. 174, no. 4016, p. 1321-1324.
de Vancouver, G., D. Byers, M. J., and Strain, J. M., Jr., 1973, The Mariner 9 apparatus coordinate system. *Jour. Geophys. Research*, v. 78, no. 20, p. 4393-4404.
Wu, S. C., Schuber, J. J., Nakai, S. M., Jordan, Raymond, and Blain, K. R., 1973, Photogrammetric evaluation of Mariner 9 photographs. *Jour. Geophys. Research*, v. 78, no. 20, p. 4405-4416.
Wu, S. C., 1973, Topographic mapping of Mars. U.S. Geol. Survey Interagency Rept. 63 (in press).



INDEX TO 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, identified by vertical numbers. Pictures other than those shown in the mosaic were used for portrayal in the unshaded area. Also shown are the high-resolution B camera pictures, identified by italic numbers.

A camera pictures	High-resolution B camera pictures
1 021218	1 021218
2 021219	2 021219
3 021220	3 021220
4 021221	4 021221
5 021222	5 021222
6 021223	6 021223
7 021224	7 021224
8 021225	8 021225
9 021226	9 021226
10 021227	10 021227
11 021228	11 021228
12 021229	12 021229
13 021230	13 021230
14 021231	14 021231
15 021232	15 021232
16 021233	16 021233
17 021234	17 021234
18 021235	18 021235
19 021236	19 021236
20 021237	20 021237
21 021238	21 021238
22 021239	22 021239
23 021240	23 021240
24 021241	24 021241
25 021242	25 021242
26 021243	26 021243
27 021244	27 021244
28 021245	28 021245
29 021246	29 021246
30 021247	30 021247
31 021248	31 021248
32 021249	32 021249
33 021250	33 021250
34 021251	34 021251
35 021252	35 021252
36 021253	36 021253
37 021254	37 021254
38 021255	38 021255
39 021256	39 021256
40 021257	40 021257
41 021258	41 021258
42 021259	42 021259
43 021260	43 021260
44 021261	44 021261
45 021262	45 021262
46 021263	46 021263
47 021264	47 021264
48 021265	48 021265
49 021266	49 021266
50 021267	50 021267
51 021268	51 021268
52 021269	52 021269
53 021270	53 021270
54 021271	54 021271
55 021272	55 021272
56 021273	56 021273
57 021274	57 021274
58 021275	58 021275
59 021276	59 021276
60 021277	60 021277
61 021278	61 021278
62 021279	62 021279
63 021280	63 021280
64 021281	64 021281
65 021282	65 021282
66 021283	66 021283
67 021284	67 021284
68 021285	68 021285
69 021286	69 021286
70 021287	70 021287
71 021288	71 021288
72 021289	72 021289
73 021290	73 021290
74 021291	74 021291
75 021292	75 021292
76 021293	76 021293
77 021294	77 021294
78 021295	78 021295
79 021296	79 021296
80 021297	80 021297
81 021298	81 021298
82 021299	82 021299
83 021300	83 021300
84 021301	84 021301
85 021302	85 021302
86 021303	86 021303
87 021304	87 021304
88 021305	88 021305
89 021306	89 021306
90 021307	90 021307
91 021308	91 021308
92 021309	92 021309
93 021310	93 021310
94 021311	94 021311
95 021312	95 021312
96 021313	96 021313
97 021314	97 021314
98 021315	98 021315
99 021316	99 021316
100 021317	100 021317
101 021318	101 021318
102 021319	102 021319
103 021320	103 021320
104 021321	104 021321
105 021322	105 021322
106 021323	106 021323
107 021324	107 021324
108 021325	108 021325
109 021326	109 021326
110 021327	110 021327
111 021328	111 021328
112 021329	112 021329
113 021330	113 021330
114 021331	114 021331
115 021332	115 021332
116 021333	116 021333
117 021334	117 021334
118 021335	118 021335
119 021336	119 021336
120 021337	120 021337
121 021338	121 021338
122 021339	122 021339
123 021340	123 021340
124 021341	124 021341
125 021342	125 021342
126 021343	126 021343
127 021344	127 021344
128 021345	128 021345
129 021346	129 021346
130 021347	130 021347
131 021348	131 021348
132 021349	132 021349
133 021350	133 021350
134 021351	134 021351
135 021352	135 021352
136 021353	136 021353
137 021354	137 021354
138 021355	138 021355
139 021356	139 021356
140 021357	140 021357
141 021358	141 021358
142 021359	142 021359
143 021360	143 021360
144 021361	144 021361
145 021362	145 021362
146 021363	146 021363
147 021364	147 021364
148 021365	148 021365
149 021366	149 021366
150 021367	150 021367
151 021368	151 021368
152 021369	152 021369
153 021370	153 021370
154 021371	154 021371
155 021372	155 021372
156 021373	156 021373
157 021374	157 021374
158 021375	158 021375
159 021376	159 021376
160 021377	160 021377
161 021378	161 021378
162 021379	162 021379
163 021380	163 021380
164 021381	164 021381
165 021382	165 021382
166 021383	166 021383
167 021384	167 021384
168 021385	168 021385
169 021386	169 021386
170 021387	170 021387
171 021388	171 021388
172 021389	172 021389
173 021390	173 021390
174 021391	174 021391
175 021392	175 021392
176 021393	176 021393
177 021394	177 021394
178 021395	178 021395
179 021396	179 021396
180 021397	180 021397
181 021398	181 021398
182 021399	182 021399
183 021400	183 021400
184 021401	184 021401
185 021402	185 021402
186 021403	186 021403
187 021404	187 021404
188 021405	188 021405
189 021406	189 021406
190 021407	190 021407
191 021408	191 021408
192 021409	192 021409
193 021410	193 021410
194 021411	194 021411
195 021412	195 021412
196 021413	196 021413
197 021414	197 021414
198 021415	198 021415
199 021416	199 021416
200 021417	200 021417
201 021418	201 021418
202 021419	202 021419
203 021420	203 021420
204 021421	204 021421
205 021422	205 021422
206 021423	206 021423
207 021424	207 021424
208 021425	208 021425
209 021426	209 021426
210 021427	210 021427
211 021428	211 021428
212 021429	212 021429
213 021430	213 021430
214 021431	214 021431
215 021432	215 021432
216 021433	216 021433
217 021434	217 021434
218 021435	218 021435
219 021436	219 021436
220 021437	220 021437
221 021438	221 021438
222 021439	222 021439
223 021440	223 021440
224 021441	224 021441
225 021442	225 021442
226 021443	226 021443
227 021444	227 021444
228 021445	228 021445
229 021446	229 021446
230 021447	230 021447
231 021448	231 021448
232 021449	232 021449
233 021450	233 021450
234 021451	234 021451
235 021452	235 021452
236 021453	236 021453
237 021454	237 021454
238 021455	238 021455
239 021456	239 021456
240 021457	240 021457
241 021458	241 021458
242 021459	242 021459
243 021460	243 021460
244 021461	244 021461
245 021462	245 021462
246 021463	246 021463
247 021464	