



**NOTES ON BASE**  
This map is one of a three-sheet set that shows combined surface markings, shaded relief, and topographic contours of Mars. Shaded relief was taken from published maps (U.S. Geological Survey, 1980). Surface markings (shaded) in the eastern and western regions are also those of existing maps (U.S. Geological Survey, 1984a). Surface markings have been added in the polar regions and in areas not covered by the original set of Viking images used to compile the existing maps. Contours were taken from topographic maps of the U.S. Geological Survey (1989).

**PROJECTIONS**  
The figure of Mars used for computing the map projections is an oblate spheroid (flattening of 1/192) with an equatorial radius of 3,393.4 km and a polar radius of 3,273.2 km. This figure is less complex than the topographic figure (described below) which the contour lines are based. The Mercator projection is used between lat ±57° and the Polar Stereographic projection is used for the polar regions north and south of the 57° parallels. The projections have a common scale of 1:8,418,000 at lat ±54°. Longitude increases to the west in accordance with astronomical convention for Mars. Latitudes are geographic.

**CONTROL**  
Horizontal and vertical controls were established by analytical photogrammetric aerotriangulation (Wu and Schaller, 1984), by using the General Analytical Triangulation (GIANT) program of the U.S. Geological Survey. Primary controls used in the control network include the Viking Orbiter Secondary Experiment Data Record, radar occultation measurements from both Marsiner 9 and Viking Missions (Lorenz and others, 1972; Moore and others, 1973; Lindal and others, 1979). Earth-based radar observations (Pettingill and others, 1971; Downs and others, 1975), and the Mars primary control network of the Rand Corporation (Davies and others, 1978).

**ALBEDO**  
Original maps of the surface albedo were compiled from a selected set of Viking Orbiter images acquired through reflector clear filters when the solar planetocentric longitude (L) with respect to Mars was 67° to 89° and when the solar zenith angle was small. Complete coverage of the western and eastern regions could not be obtained during this period. Therefore, Viking Orbiter images acquired at different times, Marsiner 9 images (Bateson and Inge, 1978), maps made with the Viking infrared Thermal Mapper (Petrovic and Meyer, 1981), and a map compiled from Earth-based pictures (Inge and others, 1976) were used as necessary to complete the mapping. These sources are not necessarily consistent with the seasonal constraints of the first dataset. Details of the albedo markings were drawn on photographic copies of the original shaded relief maps. The overall albedo base was maintained by reference to the low-resolution, solar albedo map and to the Earth-based source.

**ANALYSIS AND PORTRAIT OF ALBEDO MARKINGS** were made by Susan L. Davis and by L. Inge.

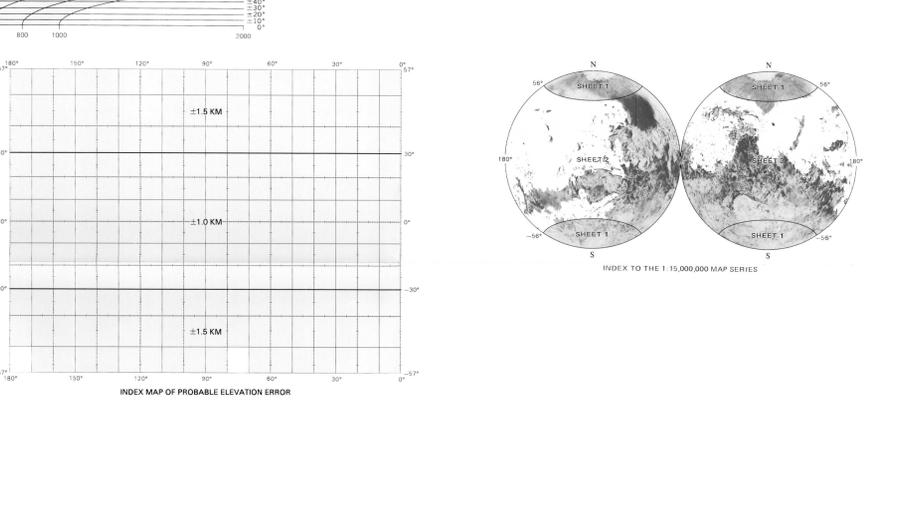
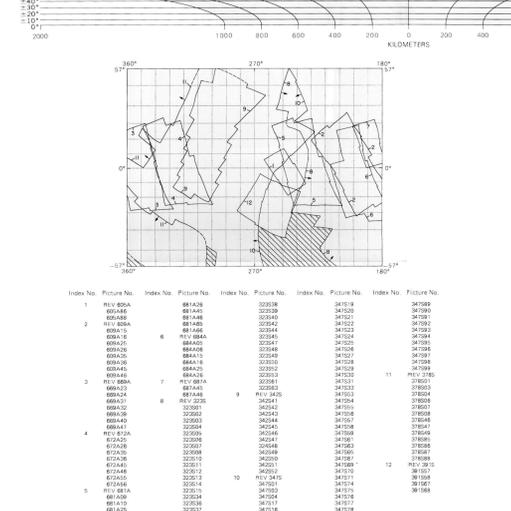
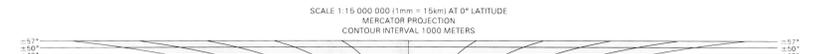
**PLANIMETRY**  
The mapping bases used for these three sheets (U.S. Geological Survey, 1985a) were assembled from 15,000,000-scale shaded relief maps (Bateson and others, 1979), reduced and digitally transformed to the projections described above. These bases were used to position details taken from Viking Orbiter pictures during digital preprint. Shaded relief is shown as illuminated from the west. Airbrush portrayals of the shaded relief and albedo were done according to interpretive techniques described by Inge and Bridges (1976).  
Shaded relief analysis and portrayal were made by Barbara J. Hall.

**CONTOURS**  
Because Mars has no surface water and hence no sea level, the datum (the 0 km contour line) for elevations is defined by a gravity field described by spherical harmonics of fourth order and second degree (Lorenz and others, 1973), combined with a 6.1 millibar atmospheric pressure surface derived from radio occultation data (Moore and others, 1973; Christensen, 1975). This datum can be approximated by a triaxial ellipsoid with semi-major axes of A=3,394.6 km and B=3,293.3 km and semi-minor axis of C=3,276.3 km. Semi-major axis A intersects the Mars surface at long 105° (Wu, 1978, 1981).  
Contour lines between the ±30° parallels were transferred from the 1:15,000,000-scale topographic maps originally compiled from Viking Orbiter images on analytical stereograms (Wu and others, 1982). Contour lines north and south of lat ±30° were compiled from measurements made by both Viking and Marsiner 9 experiments, which employed the ultraviolet spectrometer (Hord and others, 1974) and the infrared interferometer spectrometer (Corrath and others, 1973), and from elevation data of both the Mars primary control network (Davies and others, 1978) and the Mars planetwide control network (Wu and Schaller, 1984).

**COLOR**  
No attempt was made to duplicate 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, 1980, 1983, 1986, and in press), except for provisional names, which are indicated by an asterisk. The positions of named features are taken from published maps of Mars.  
M 15M 0/270 2AT: Abbreviation for Mars; 1:15,000,000 series; center of map, lat 0°, long 270° 2nd edition; shaded relief with albedo markings (A), topographic contours and nomenclature (T).

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**INDEX OF PRIMARY MAPPING SOURCES**  
The rendition of most of the surface markings on this map was controlled by reference to the pictures outlined above. Picture numbers consist of an orbital revolution number, a spacecraft designation number, and a frame number. For example, 658A65 was the 86th picture taken by Voyager 1 (A) during revolution number 606. Pictures taken by Voyager 1 after revolution 959 are sometimes designated without the leading digit of the revolution number and with an "S" for the spacecraft number. Thus, 1378A65 is the same picture as 378S65. Dashed lines indicate position of limb. Useful coverage is not available in cross-hatched areas. Copies of various enhancements of these pictures are available from National Space Science Data Center, Code 601, Goddard Space Flight Center, Greenbelt, MD 20771.

**NOTE TO USERS**  
Users noting errors or omissions are urged to indicate them on the map and to forward it to the U.S. Geological Survey, Building 4, Room 454, 2250 North Gemini Drive, Flagstaff, Arizona 86001. A replacement copy will be returned.