

# MARINER VENUS / MERCURY 1973

## STATUS BULLETIN

### Mariner 10 Approaches Mercury for Encounter III on Sunday, 16 March 1975

On Sunday, 16 March 1975, Mariner 10 will have operated in space continuously for more than 16 months since it was launched on 3 November 1973. On 16 March, Mariner 10 will also have completed its second 176-day orbital circuit around the Sun. During that same 6-month period since Mariner 10's second Mercury encounter (21 September 1974) on the sunlit side, the planet will have rotated three times on its

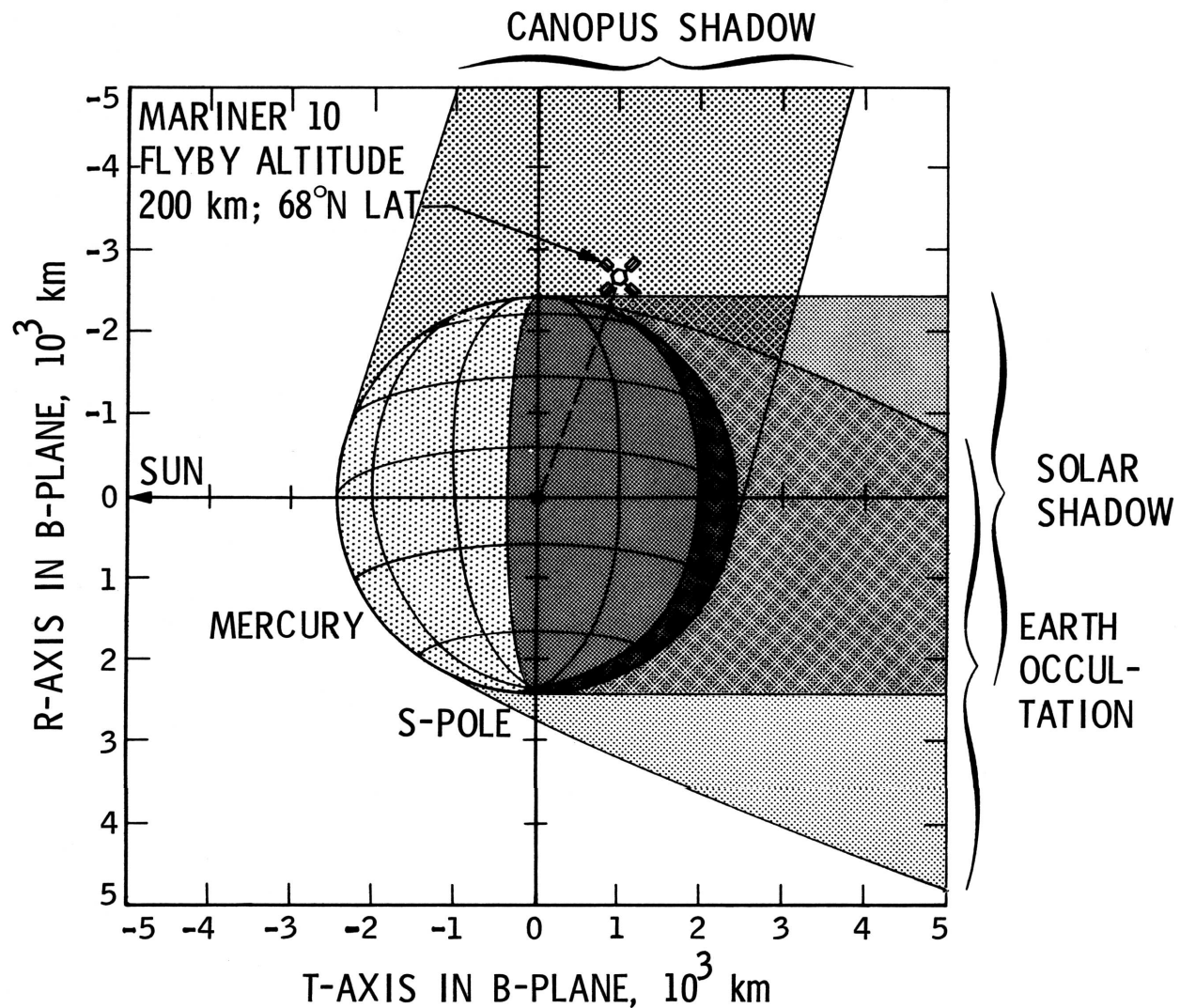
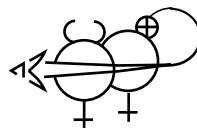


Fig. 1. Mercury Encounter III Geometric Orientations as seen by Mariner 10 during Approach



axis and completed two of its own, 88-day orbits around the sun. This planned coincidence will permit a third and final encounter (Encounter III) with the fast-moving planet. Mercury may now be seen low in the western sky shortly after sunset.

At about 3:39 pm PDT on 16 March 1975, Mariner 10 is scheduled to overtake and pass Mercury with a relative speed of about 11 km/sec (25,000 mph), flying across the planet's north polar area at about 70 deg North Latitude on the dark side and at an altitude of only 200 km (125 miles). A perspective view of the flyby is shown in the artist's rendering on the next page. Views from the Sun and Earth are also shown. This close pass was desired by the MVM Experimenters to permit additional measurements of the planet-related magnetic field observed in the first encounter. The main question which the Experimenters want to resolve is the origin of that field; i.e., whether it is intrinsic to Mercury or induced by a complex interaction with the solar wind.

To accomplish such an astonishingly accurate flyby performance, Mariner 10 executed three trajectory correction maneuvers (TCMs 6, 7, 8) since its Encounter II, 6 months ago. The most recent of these precise changes in spacecraft speed and direction (TCM 8) took place at 2:00 am PDT on Friday, 7 March 1975. Only a 3-second burn of the rocket engine was required to shift the closest approach point upward about 160 km (100 miles) farther away from Mercury's surface so as to lessen the possibility of a collision. No Earth occultation is planned because Mariner's tape recorder ceased functioning in August 1974.

Starting about 2.5 days before Encounter III, at a distance of about 2 million kilometers, medium-resolution TV pictures of Mercury's disk will be taken to check out and calibrate the TV cameras and the radio telemetry link with Earth. Ultraviolet scans of the Planet's terminator or shadow's edge will also be performed to obtain more information about the helium atmosphere. About 255 TV pictures at high resolution (detail) will be transmitted to the 64-meter (210 ft) antenna at the Canberra Deep Space Station at a rate of 117.6 kbits/sec (one picture every 42 sec) starting about 2 hours before periapsis (closest approach). Because of the flyby geometry, a few of the closest pictures are expected to have the highest resolution obtained during this mission, i.e., 50 meters, compared with previous 120 meters. Details of the mission operations sequence for the week prior to and following Encounter III are given in nine figures toward the end of this Bulletin.

About 13 minutes before Mariner 10's closest approach, the TV picture taking will be halted because the camera view fields will then traverse onto Mercury's dark side. Photography will be resumed about 5 minutes after the close approach and will continue until about 12 hours thereafter. At that time, Mariner 10 will bid its final farewell to Mercury and will continue to orbit the Sun every 6 months for ages to come. Its attitude control gas supply is, however, expected to be depleted within a few days after the encounter; the spacecraft will begin to tumble, will lose power, and will no longer be capable of communicating with the Earth.

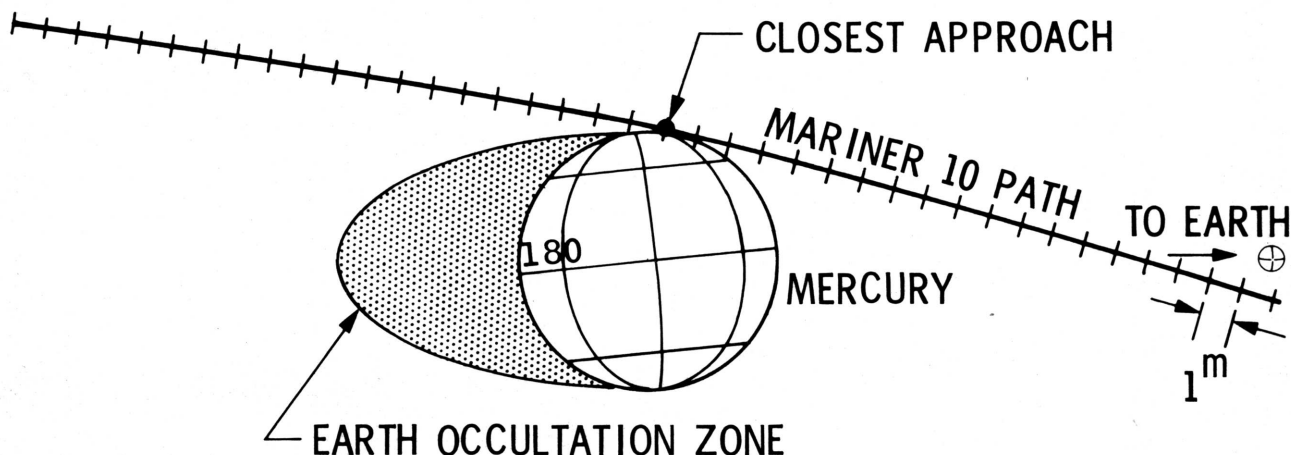
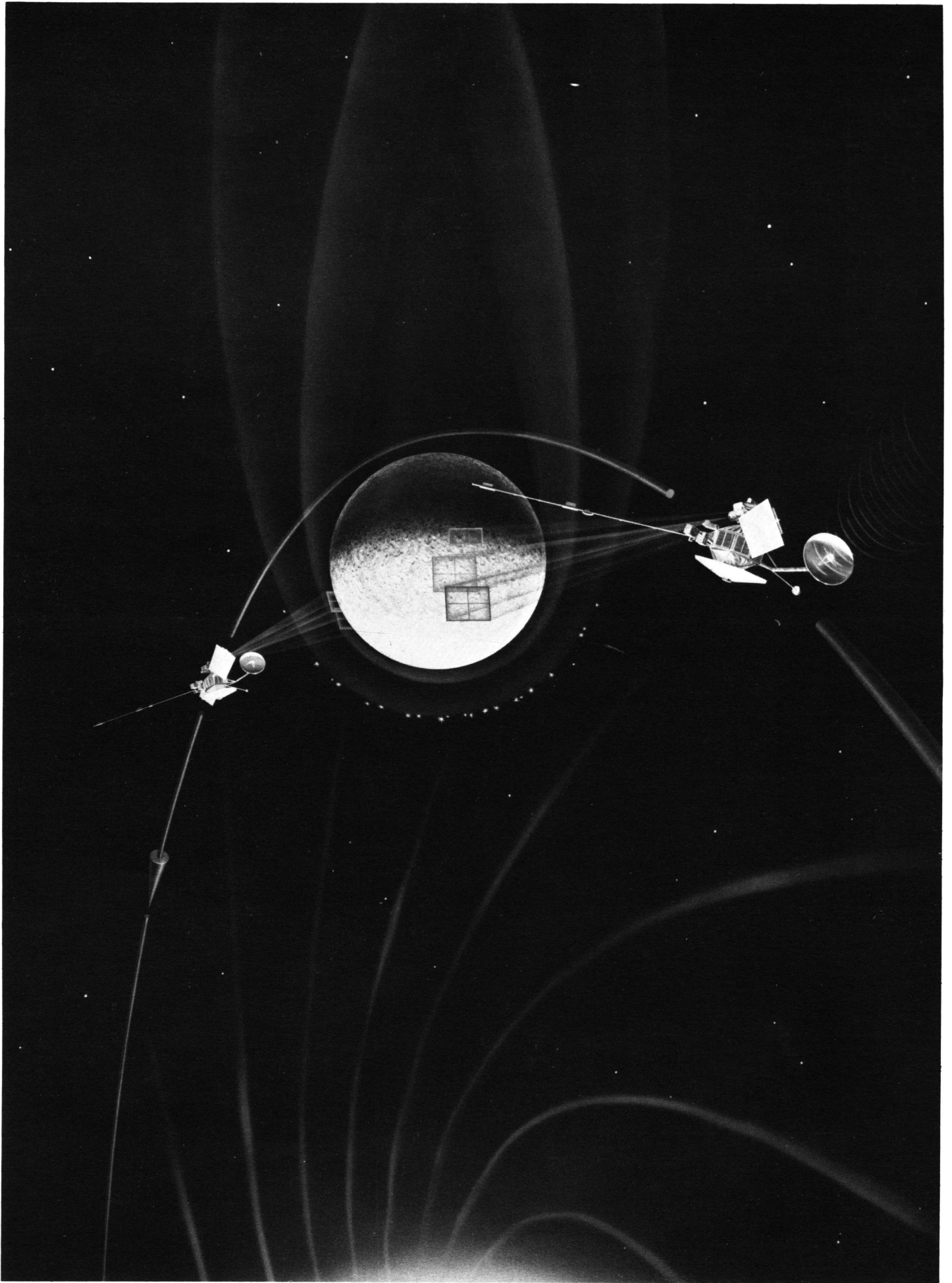
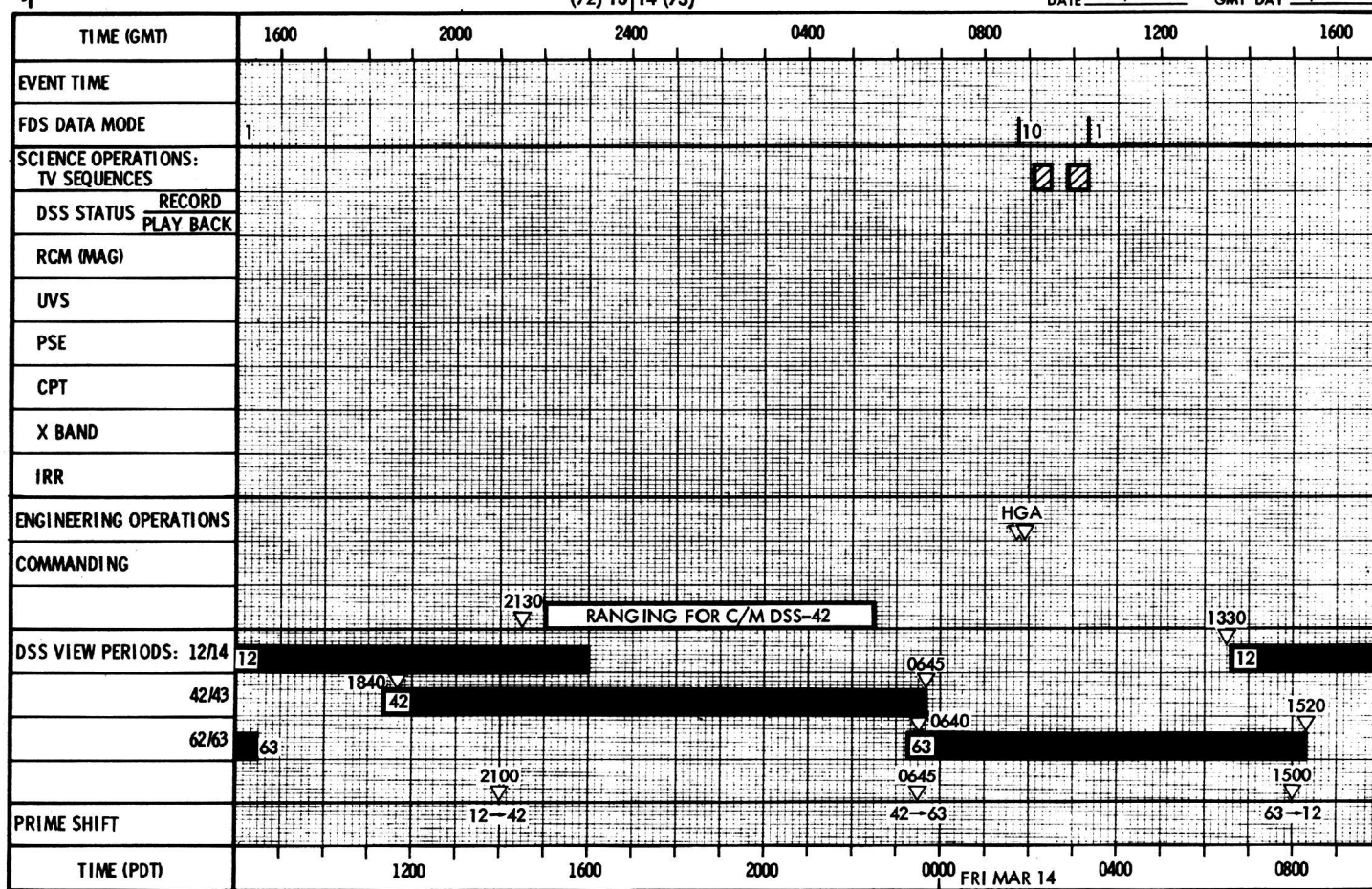


Fig. 2. View of Mercury and Mariner 10 Flight Path from Sun

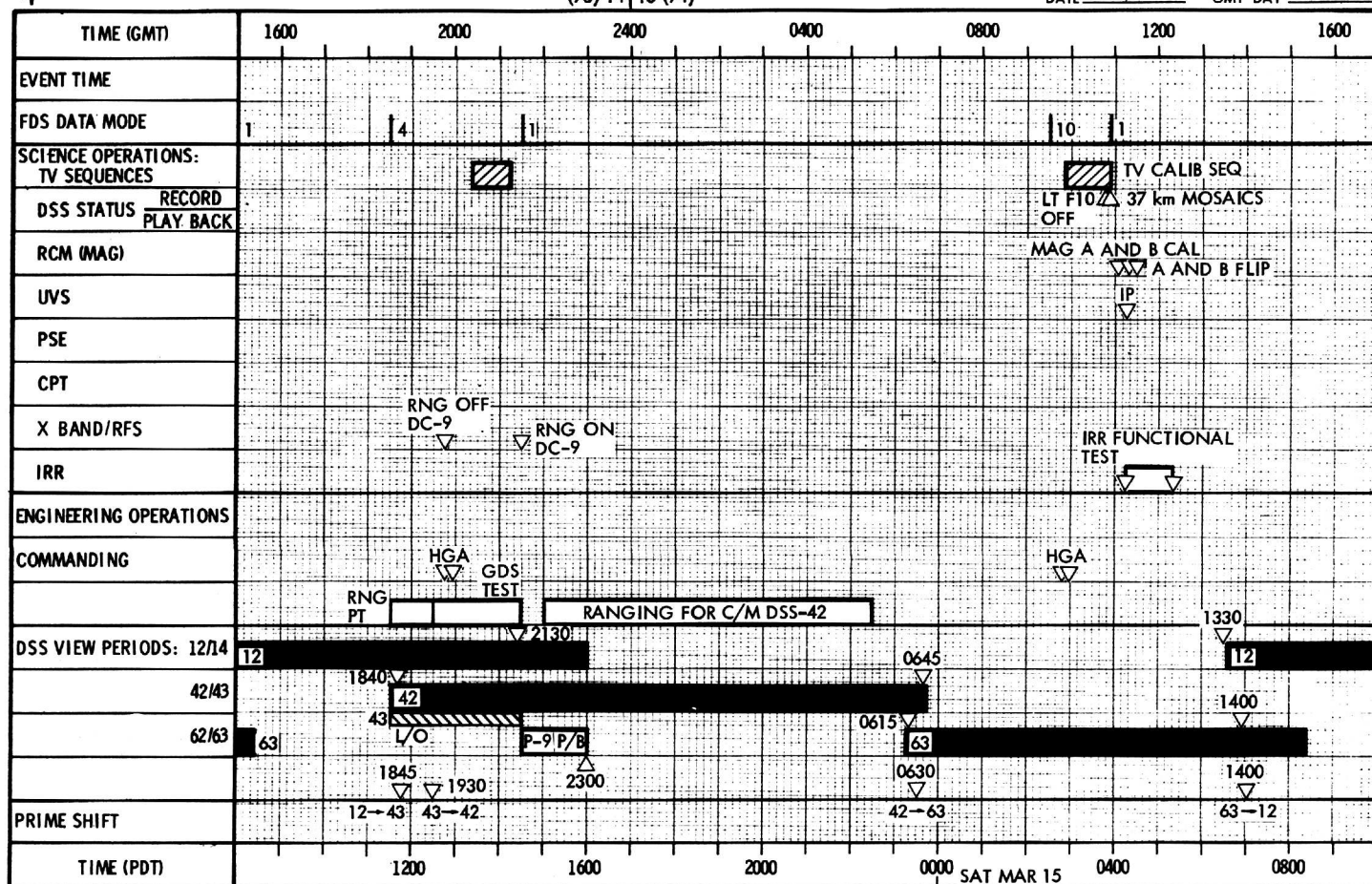




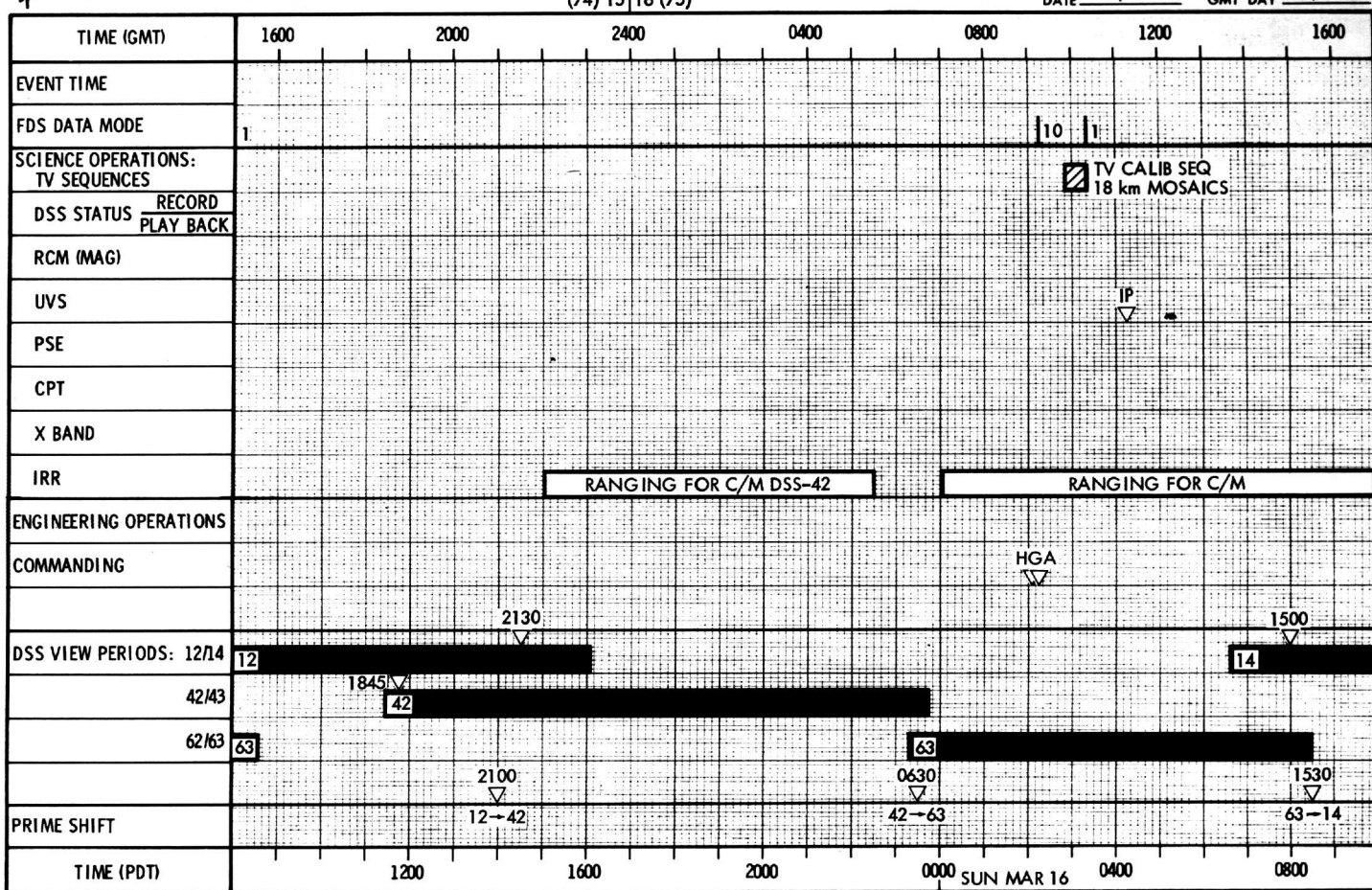




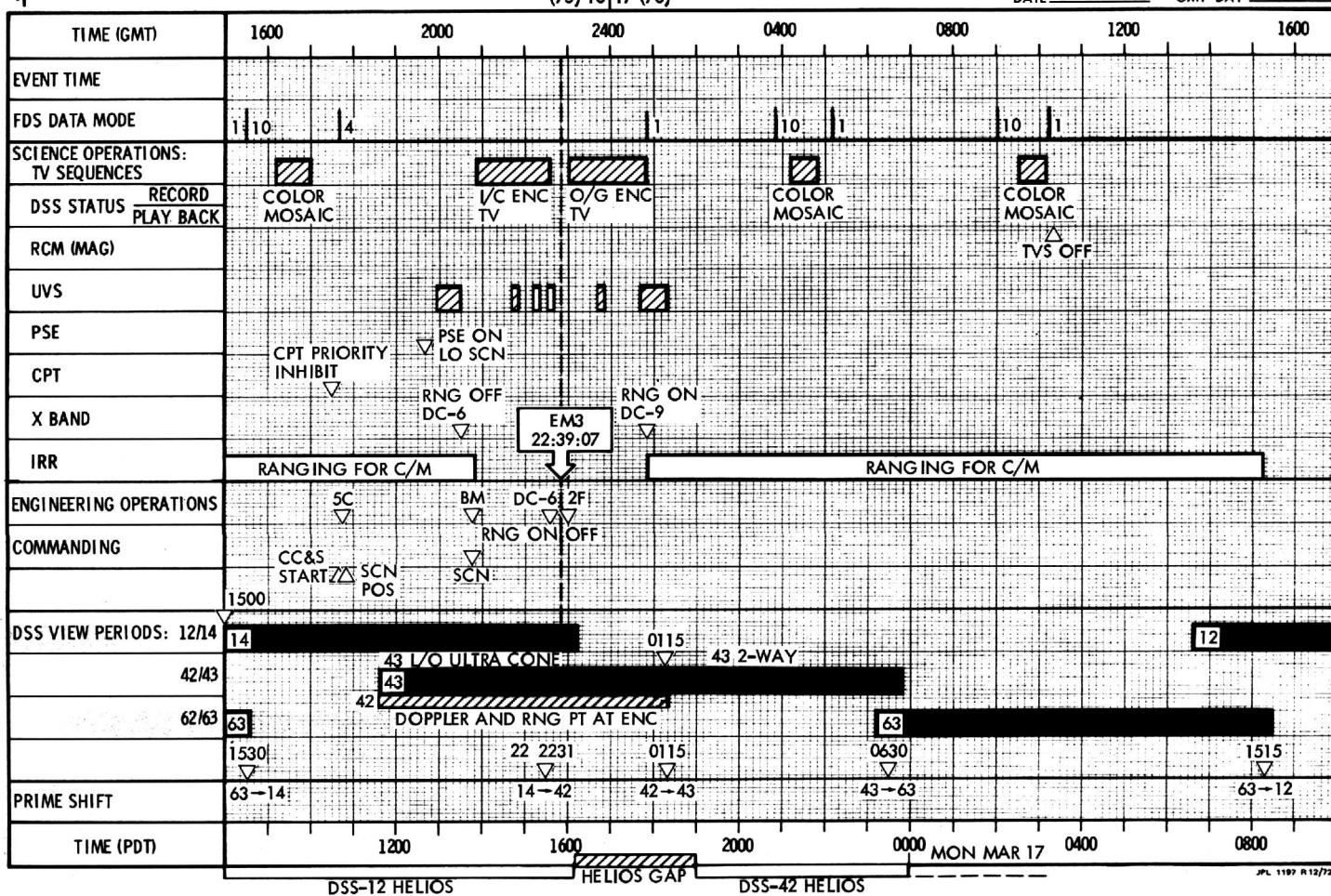
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