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*Ranger 5 Tracking Systems Data Analysis
Final Report*

C. E. McNeal

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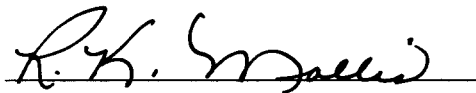
JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA

April 15, 1965

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*Ranger 5 Tracking Systems Data Analysis
Final Report*

C. E. McNeal

A handwritten signature in dark ink, appearing to read "R. K. Mallis", is written over a horizontal line.

R. K. Mallis, Chief
Communications Engineering and
Operations Section

JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA

April 15, 1965

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ABSTRACT

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This Report presents the results of the analysis of the tracking performance carried out by the Deep Space Instrumentation Facility for *Ranger 5*. Preflight preparations and the results of postflight analysis are discussed. Tracking performance of the stations was determined by a study of tracking data, oscillographs and station reports, and preflight and postflight calibrations.

Auth

I. INTRODUCTION

Ranger 5 was launched by an *Atlas/Agena B* from Cape Kennedy on October 18, 1962. Liftoff occurred at 16:59:07.8 GMT. Injection into a lunar transfer orbit occurred at 17:34:49.0 GMT. All mark events occurred at nominal times resulting in solar panel opening and Sun acquisition (which took place at $L + 48$ and 51 min, respectively).

Initial acquisition by Deep Space Instrumentation Facility (DSIF) Station 59 occurred at 17:29:28 GMT. Station 51 was able to acquire intermittent one-way RF lock from 17:31:52 to 17:35:30 GMT. Station 41 acquired the spacecraft transponder in one-way lock at 17:45:39, and the DSIF tracking stations tracked the spacecraft continuously thereafter until October 23, 1962.

Loss of solar panel power occurred at 1812Z, October 18, 1962 and the spacecraft continued to function on battery power until depletion at approximately 0145Z. Prior to battery depletion, a midcourse maneuver was attempted but battery power was exhausted before completion. After loss of battery power, the transponder operated intermittently on solar power as a result of a tumbling motion.

Occultation occurred at 16:38:19 GMT, October 21, 1962, and reappearance occurred at approximately 17:45 GMT. Station 11 continued to track the capsule signal for a two-hour period prior to its *Mariner II* tracking period. On October 30, 1962 *Ranger 5* tracking operations were terminated.

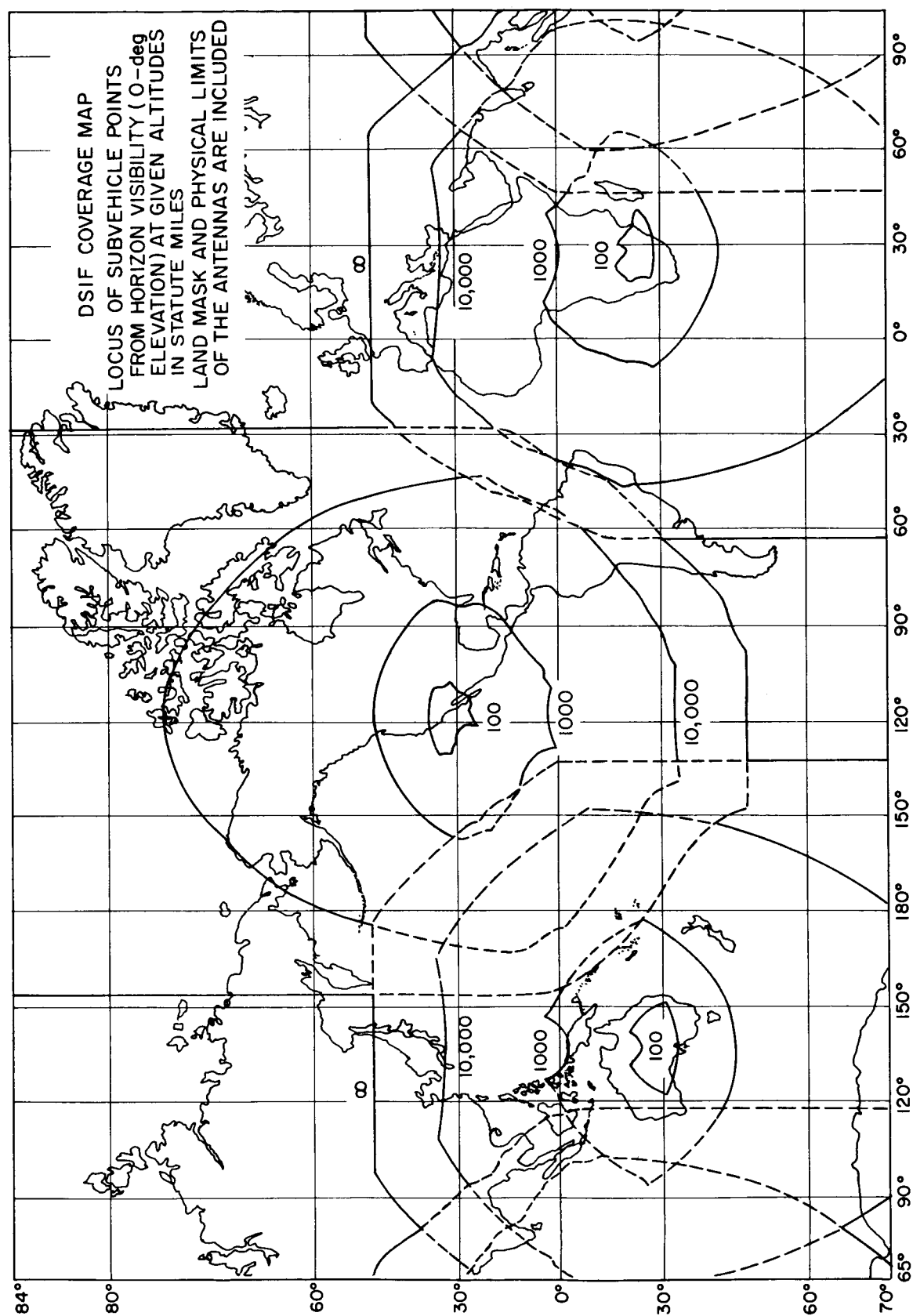


Fig. 1. DSIF coverage map

II. SYSTEMS CONFIGURATION

The DSIF consists of four permanent tracking stations (see Fig. 1), a spacecraft monitoring station, and a mobile tracking station. The permanent stations are located at Goldstone, California; at Woomera, Australia; and at Johannesburg, South Africa. Each permanent station is equipped with an 85-ft D parabolic reflector antenna. Two stations are located at the Goldstone site. The Spacecraft Monitoring Station (SMS) is located at Cape Kennedy near Launch Complex 12 and is equipped with a manually positioned 6-ft D antenna. The Mobile Tracking Station (MTS) is currently located near the Johannesburg Station site and is equipped with a 10-ft D parabolic reflector antenna. This mobile station is used for initial acquisition and tracking of the spacecraft. Block diagrams of the DSIF stations are shown in Figs. 2 through 8. Antenna and receiver parameters are given in Tables 1 and 2.

The Goldstone Pioneer site (Station 11) was used as a backup facility during the mission. This station has a standard, phase-locked, 960-Mc receiver. A maser amplifier, a parametric amplifier (apex-mounted), and a horn feed are used to increase receiver sensitivity and reduce system noise temperature. Nonredundant ground support equipment is provided to record the TV subsystem video signal on magnetic tape. The antenna was positioned in accordance with data furnished from Station 12 via the intersite microwave link. No angle data, doppler data, or spacecraft telemetry are available from this station.

The Goldstone Echo site (Station 12) was used as the prime communication station. This station has a standard, phase-locked, 960-Mc receiver duplexed with a 200-w, 890-Mc transmitter to provide both precision two-way doppler and spacecraft command capability. A 50-w back-

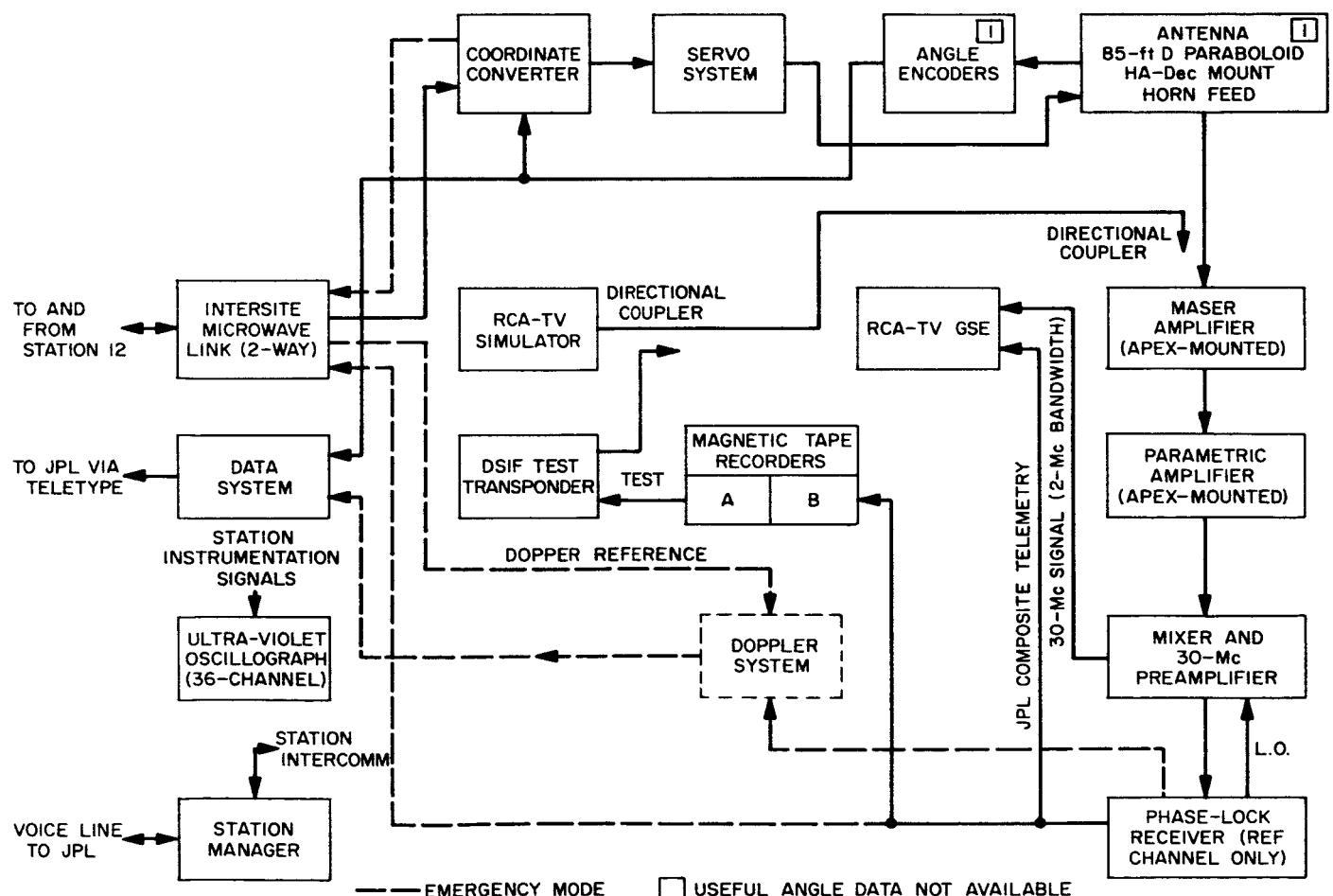


Fig. 2. Block diagram, Station 11

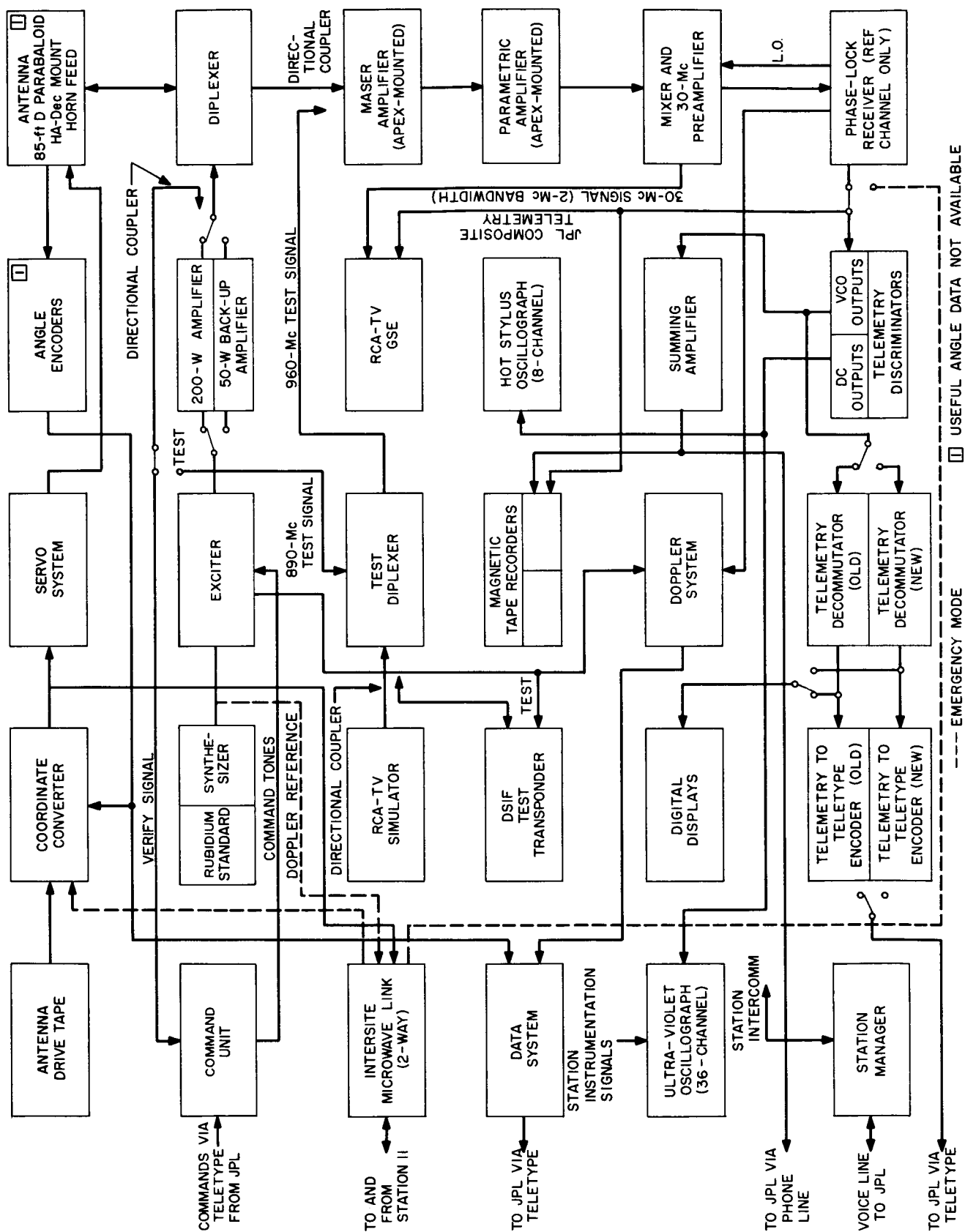


Fig. 3. Block diagram, Station 12

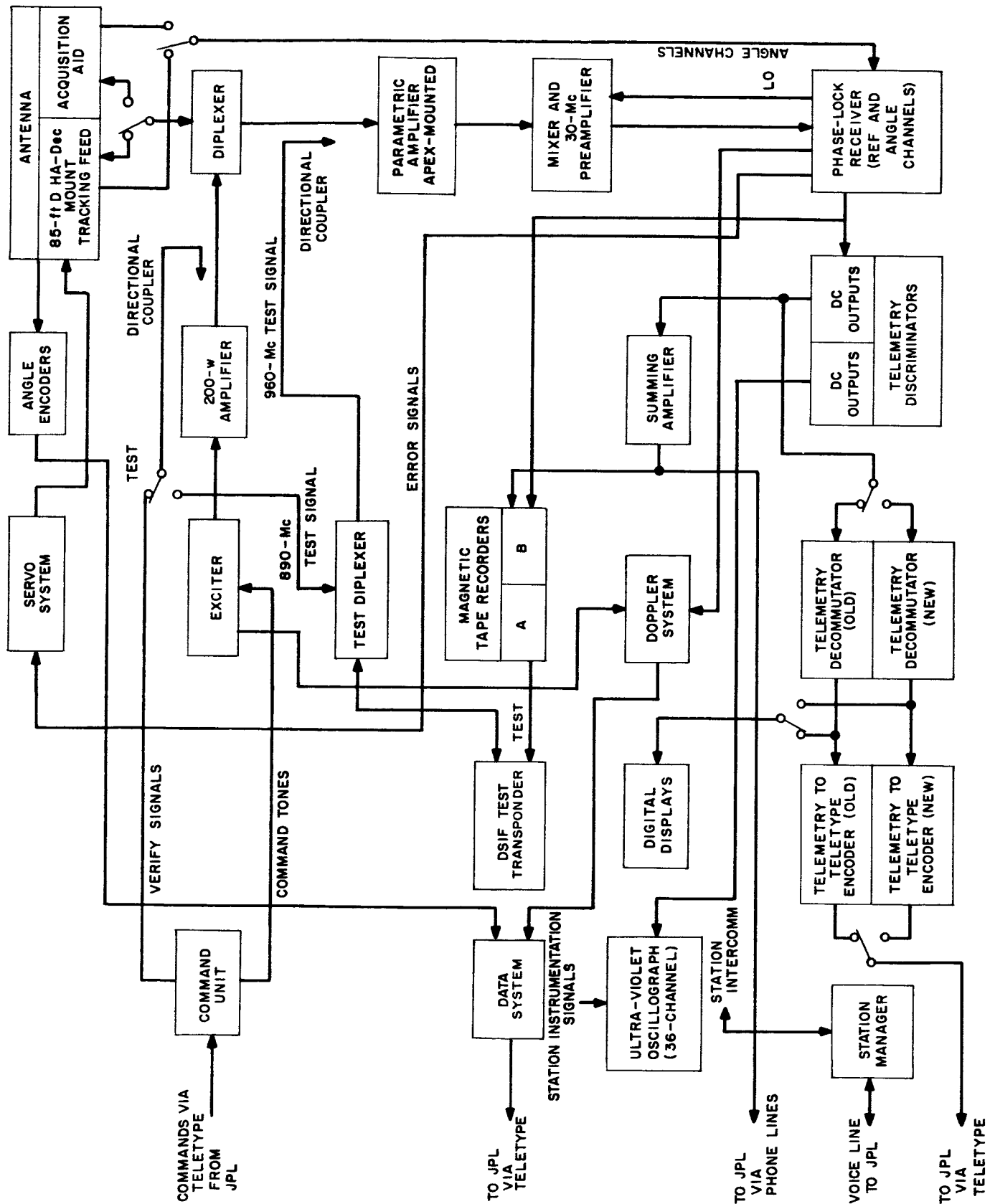


Fig. 4. Block diagram, Station 41

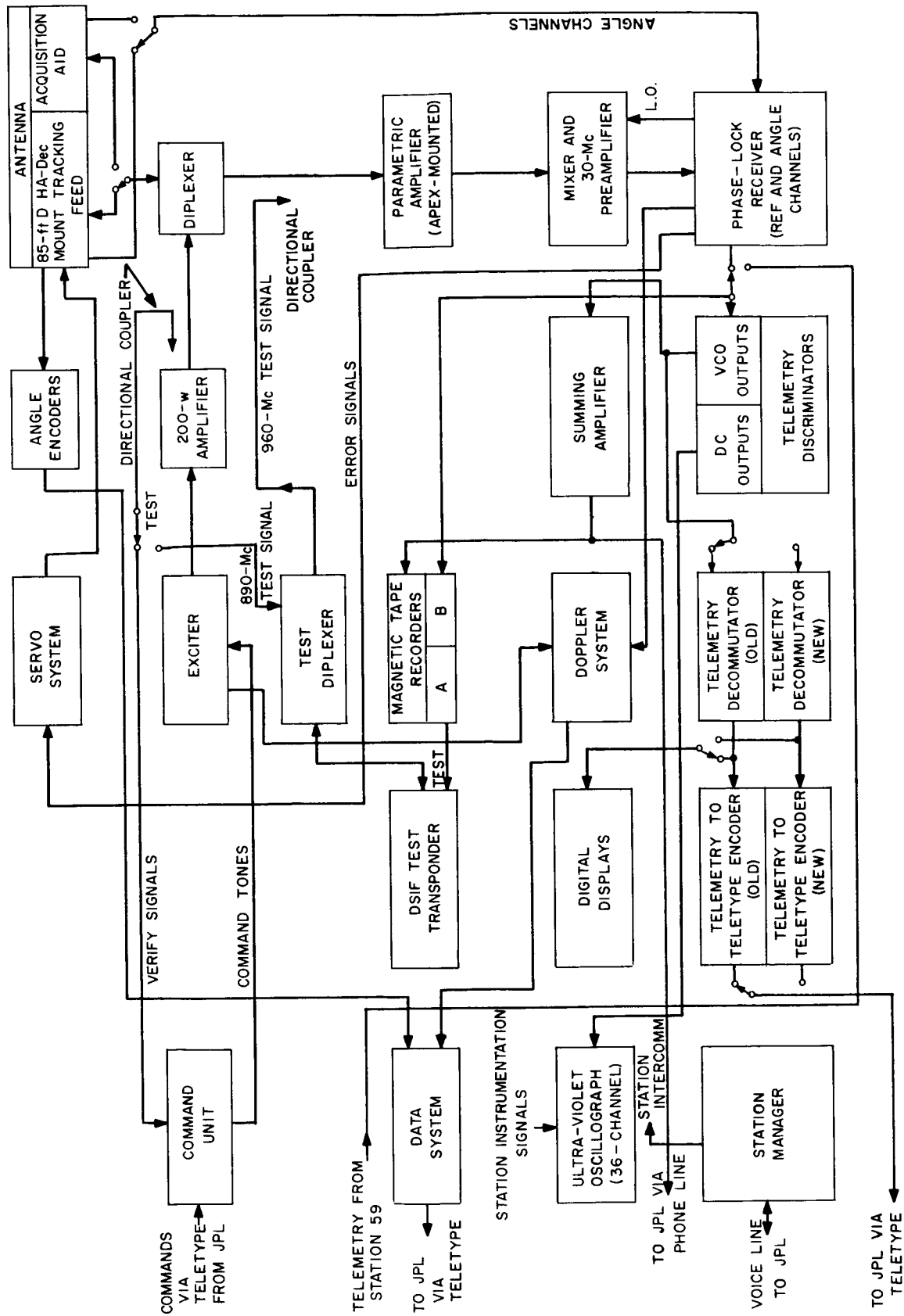


Fig. 5. Block diagram, Station 51

up RF amplifier is available for the transmitter. A maser amplifier, a parametric amplifier (apex-mounted), and a horn feed are used to increase receiver sensitivity and reduce system noise temperature. A read-write-verify (RWV) unit is incorporated in the command system and allows readback and confirmation of transmitted commands. The primary function of this station during the mission was to track the transponder and record the pictures from the TV subsystem. Drive tapes were used to position the antenna. Equipment is available for encoding telemetry data in teletype format for transmission to JPL in near-real time. Real time telemetry is transmitted to JPL via a commercial telephone circuit. Two-way doppler (using a rubidium standard) is transmitted to JPL in near-real time via teletype. No angle data are available.

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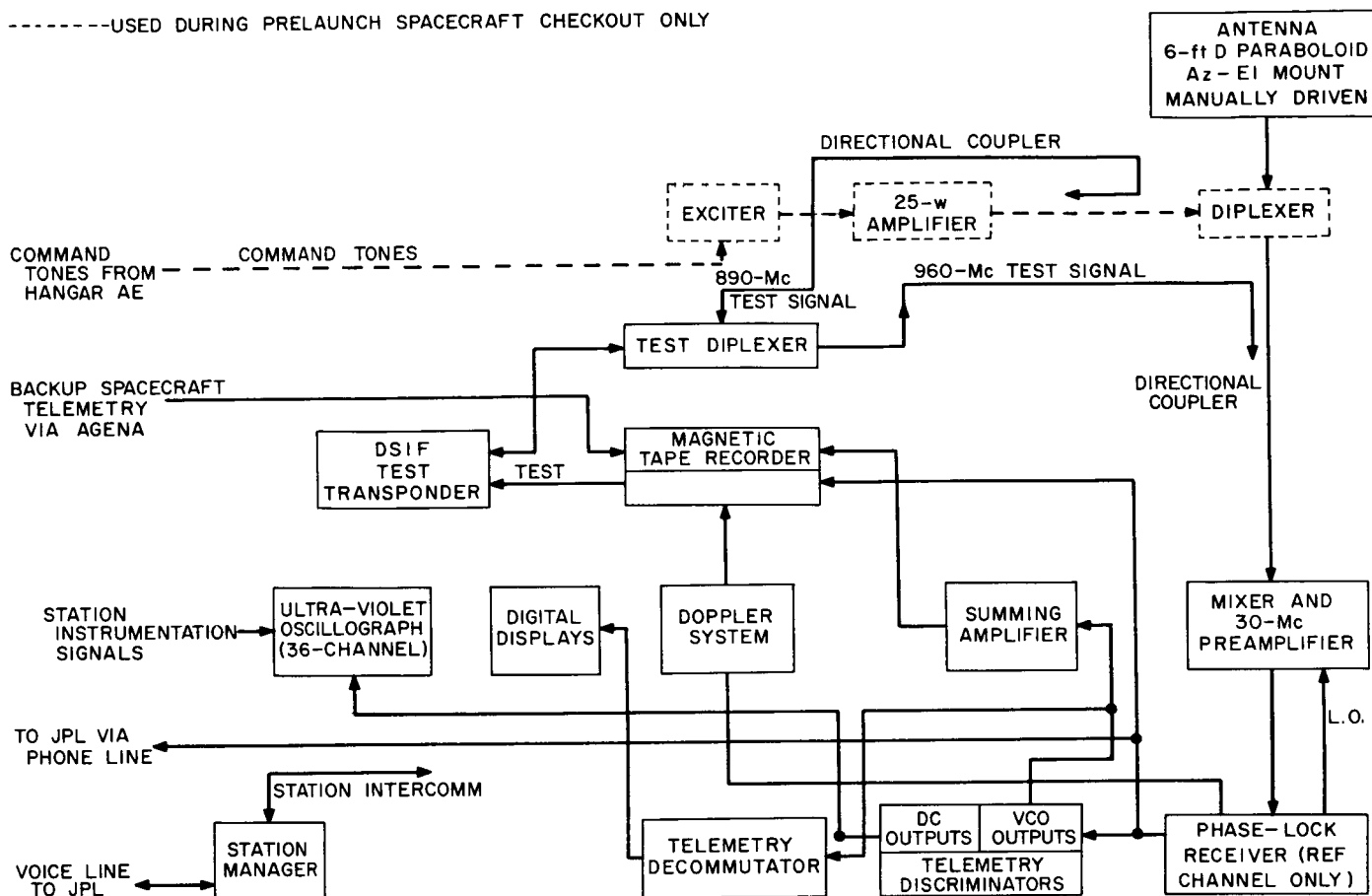


Fig. 7. Block diagram, Station 71

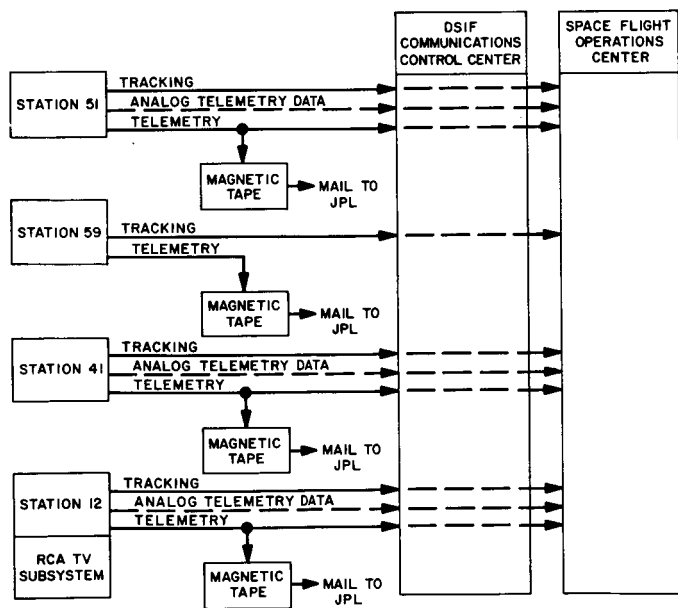


Fig. 8. Data flow from DSIF stations to JPL

near-real time via teletype. Real time telemetry is transmitted to JPL via a commercial telephone circuit.

The Mobile Tracking Station (59) uses a standard, phase-locked, 960-Mc receiver diplexed with a 25-w transmitter, thus giving precision two-way doppler capability. Trajectory data must be available to facilitate early acquisition on the first pass over South Africa. This station's primary function is to provide angle data and two-way doppler during the injection phase of the flight when the angular rates are beyond the capabilities of the large antennas. Angle data and two-way doppler are transmitted to JPL in near-real time via teletype.

The Spacecraft Monitoring Station (71) has a standard, phase-locked, 960-Mc receiver diplexed with a 25-w transmitter to provide prelaunch checkout of the spacecraft. An RWV receiver is located at the station and is cabled to command system equipment in the spacecraft hangar to allow checkout of the spacecraft. The station is

Table 1. DSIF antenna parameters

DSIF station	Antenna type	Reflector diameter, ft	Tracking rate, deg/sec		Antenna gain, db ^a		Antenna ellipticity, db		Excess ^d noise temp, °K
			Azimuth or hour angle	Elevation or declination	Receiving ^b	Transmitting ^c	Receiving	Transmitting	
11	HA-Dec	85	0.7	0.7	45.7 ± 0.8 ^e	N.A.	0.5 ± 0.1	—	35 +0 -15
12	HA-Dec	85	0.7	0.7	45.7 ± 0.8 ^e	45.2 ± 0.9	0.5 ± 0.1	1.3 ± 0.1	35 ± 8
41	HA-Dec	85	0.7	0.7	43.7 ± 0.9 ^f	41.9 ± 0.9	2.7 ± 0.1	3.0 ± 0.4	43 +0 -10
51	HA-Dec	85	0.7	0.7	43.7 ± 0.9 ^f	41.9 ± 0.9	2.7 ± 0.1	3.0 ± 0.4	43 +0 -10
59	Az-El	10	20	20	26.3 ± 0.4 ^f	25.8 ± 0.4	0.6 ± 0.3	2.7 ± 0.3	100 ± 20

^aAll gains are for matched polarization, but do not include ellipticity.

^bReceiving gain includes all losses from feed to LNA input.

^cTransmitting gain includes all losses from feed to transmitter.

^dIncludes antenna diplexer losses and transmission line losses to input of LNA.

^eHorn feed.

^fTracking feed.

Table 2. DSIF receiver parameters

Item	Station 11	Station 12	Station 41	Station 51	Station 59
Nominal frequency, Mc ^a	960.05 ± 0.03	960.05 ± 0.03	960.05 ± 0.03	960.05 ± 0.03	960.05 ± 0.03
System noise temp, °K ^b	110 ± 20	110 ± 20	240 ± 25	240 ± 25	1250 ± 170
Loop noise bandwidth at threshold, cps	20 ± 4 (60 ± 10)	20 ± 4 (60 ± 10)	20 ± 4 (60 ± 10)	20 ± 4 (60 ± 10)	20 ± 4 (60 ± 10)
Threshold, dbm, 20 cps 2 B _{L0}	-165 ± 1.5	-165 ± 1.5	-162 ± 1.5	-162 ± 1.5	-155 ± 1.5
Maximum input signal level, dbm	-65	-65	-65	-65	-45
Residual phase modulation (crystal oscillator phase jitter contribution) ^c	<3°p/p	<3°p/p	<3°p/p	<3°p/p	<3°p/p

^a960.05 Mc is basic two-way received frequency.

^bWith antenna pointed at cold sky. An increase of approximately 31°K will result when pointed at the Moon.

^cFor input signal level of -65 dbm with 150-cps noise bandwidth.

housed in two trailers; one contains the receiving and command checkout systems and the other the instrumentation system that records telemetry data. Real time telemetry is transmitted to JPL via a commercial telephone circuit. This station assists in checkout of the

spacecraft prior to launch and tracks the spacecraft from launch to local horizon.

Nominal view periods vs actual tracking periods for the DSIF stations are shown in Table 3.

Table 3. Nominal^a view periods vs actual tracking periods at DSIF stations

Date	DSIF station	Nominal rise GMT	Nominal set GMT	Nominal view period, hms	Acquisition by station, GMT	Loss of signal by station, GMT	Actual period, hms
Oct 18, 1962	59	Before injection	17:35:18	—	17:31:25	17:36:55	00, 05, 30
	51	Before injection	17:35:18	—	Intermittent	—	—
	41	17:46:31	01:55:40 ^b	08, 09, 09	17:45:39	02:20:00	06, 14, 21
	59	22:56:47	09:41:31 ^b	10, 44, 44	22:31:00	07:52:01	09, 01, 01
	51	22:56:47	09:41:31 ^b	10, 44, 44	23:00:02	06:53:02	07, 53, 00
Oct 19, 1962	11	08:23:17	20:26:42	12, 03, 25	08:35:50	14:39:02	06, 03, 12
	12	08:23:17	20:26:42	12, 03, 25	08:44:02	14:39:02	05, 55, 00
	41	16:41:38	02:32:16 ^b	09, 50, 38	16:51:41	19:23:00	02, 31, 19
	59	23:56:59	10:02:28 ^b	10, 05, 29	—	—	—
	51	23:56:59	10:02:28 ^b	10, 05, 29	00:12:02	10:00:02	09, 48, 00
Oct 20, 1962	11	08:45:14	20:42:02	11, 56, 49	—	—	—
	12	08:45:14	20:42:02	11, 56, 49	08:55:22	20:29:01	11, 33, 39
	41	17:01:19	02:39:47 ^b	09, 36, 29	16:59:11	20:45:51	03, 46, 40
Oct 21, 1962	59	00:10:46	10:07:46	09, 57, 00	—	—	—
	51	00:10:46	10:07:46	09, 57, 00	00:42:02	08:45:00	08, 02, 58
	11	08:52:01	16:38:16 ^c	07, 46, 18	—	20:44:43	10, 33, 11
	12	08:52:01	16:38:16 ^c	07, 46, 18	08:59:02	18:16:21	09, 07, 19

^aBased on 5-deg elevation angle.^bSet occurs on the day after rise.^cLoss of capsule beacon signal due to occultation by Moon.

A. Ground Station Modes

The seven modes of operation of the DSIF are identified as ground modes (GM) and are defined as follows:

- GM-1 Tracking the transponder signal in the two-way mode, obtaining angles, telemetry, and two-way doppler. This mode is possible at Stations 41, 51, and 59.
- GM-2 Listening for the transponder signal in the two-way mode, obtaining telemetry and two-way doppler. This mode is possible at Stations 41 and 51.
- GM-3 Tracking the transponder signal in the one-way mode, obtaining angles, telemetry, and one-way doppler. This mode is possible at Stations 41, 51, and 59.

- GM-4 Listening for the transponder signal in the one-way mode and obtaining telemetry and one-way doppler. This mode is possible at Stations 11, 41, and 51.
- GM-5 Listening for the transponder signal in the two-way mode and obtaining telemetry and two-way doppler. This mode is possible only with the combination of Stations 11 and 12.
- GM-6 Transmitting only to the transponder. No signal is received, no doppler obtained. This mode is possible at Stations 12 and 51.
- GM-7 Listening for the capsule beacon signal and obtaining capsule telemetry. This mode is possible at all DSIF stations except 59 and 71.

Table 4. Ground commands sent to Ranger 5 by DSIF stations

Command ^a	Initiated, Date/GMT	Verified ^b , GMT	Signal strength, dbm	DSIF station	Telemetry event blips
RTC-0	18/23:46:00	23:46:41	-132	51	CH B-2, 23:54:47
RTC-0	18/23:48:20	23:48:40	-132	51	
SC-1	18/23:50:00	23:50:41	-132	51	
SC-2	18/23:52:00	23:52:40	-132	51	
SC-3	18/23:54:00	23:54:40	-132	51	
RTC-2	18/24:00:00	19/00:00:41	-132	51	CH B-2, 01:03:48
RTC-2	19/00:20:00	00:20:40	-132	51	
RTC-0	19/00:48:00	00:48:41	-132	51	
RTC-0	19/00:50:00	00:50:41	-132	51	
SC-1	19/01:03:00	01:03:41	-132	51	
SC-2	19/01:05:00	01:05:41	-122	51	CH B-2-1, 01:16:45
SC-3	19/01:07:00	01:07:41	-122	51	
RTC-0	19/01:11:00	01:11:41	-122	51	
RTC-0	19/01:12:00	01:12:41	-122	51	
SC-1	19/01:16:00	01:16:41	-120	51	
SC-2	19/01:17:00	01:17:41	-120	51	CH B-2, 01:30:22
SC-3	19/01:18:00	01:18:41	-120	51	
RTC-4	19/01:29:00	01:29:41	-120	51	
RTC-3	21/07:30:47	07:31:29	-153	51	
RTC-3	21/07:58:20	07:59:01	-153	51	
RTC-3	21/08:11:10	08:11:51	-151	51	12 (stopped sending commands. A total of 23 were sent by Station 12)
RTC-3	21/08:31:20	08:32:01	-157	51	
RTC-3	21/09:38:40	08:39:21	-152	51	
RTC-3	21/09:01:14			12	
RTC-3	21/09:21:00			12	
RTC-3	21/09:33:00				

^aRTC-0 Clear command.

RTC-1 Roll override.

RTC-2 Antenna hinge angle override.

RTC-3 Antenna switchover.

RTC-4 Begin midcourse maneuver.

RTC-5 Telemetry mode change.

RTC-6 Begin terminal maneuver.

RTC-7 Turn on altimeter power.

SC-1 Midcourse maneuver roll duration.

SC-2 Midcourse maneuver pitch duration.

SC-3 Midcourse maneuver velocity increment.

SC-4 Terminal maneuver first pitch duration.

SC-5 Terminal maneuver yaw duration.

SC-6 Terminal maneuver second pitch duration.

^bVerified by ground station RWV system.

Table 5. Definition of modes

Mode	Data	Approximate duration	Telemetry subcarrier frequency, cps	Indication frequency tolerance, cps
TM-I	Launch to start of midcourse maneuver	16 hr	705	+8 -30
TM-II	Midcourse maneuver	28 min	722	± 8
TM-III	Post midcourse maneuver to end of terminal maneuver	48 hr	739	± 8
TM-IV	End of terminal maneuver to bus impact	40 min	*	*
TM-V	Capsule impact to end of mission	40 days (nominally)	*	*

*Since channel 3 data were not transmitted during these modes, they will be indicated by the type of data transmitted. Mode IV will be indicated by the loss of a majority of the subcarrier channels (see Fig. 9). During TM-V, only capsule telemetry will be available.

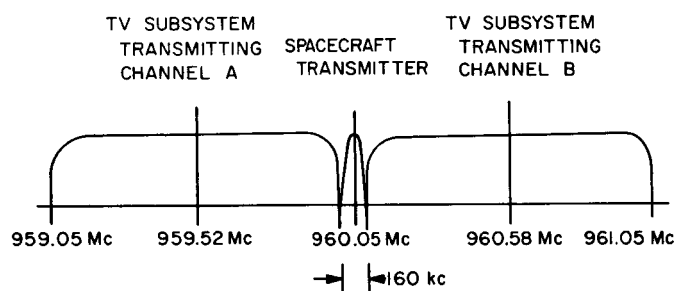


Fig. 9. Ranger TV subsystem frequency allocations

B. Spacecraft Modes

The spacecraft modes are defined according to flight periods and have been assigned identification according to the telemetry system mode for that portion of the mission. Changes of the telemetry system mode are accomplished by the central computer and sequencer (CC&S) in the spacecraft, or, in the event of a mode-change malfunction, by RTC-5 (see Table 4). Indication of the telemetry mode will either be provided by the 3F6 measurement (decommutator address 66) or by the telemetry available. Definitions and indications of these modes are given in Table 5.

The RF communication system consists of a 3-w transponder-RF amplifier and an L-band RF diplexer (see Fig. 10 for block diagram). The 890/960-Mc transponder operates through either the pseudo-omnidirectional antenna or the directional high-gain parabolic antenna. The transponder system consists of an automatic phase-tracking 890-Mc receiver and an inte-

grally related 960-Mc transmitter. The nominal transmitter frequency is 960.05 Mc. The polarization is right hand circular.

The 890-Mc receiver is a double superheterodyne, phase-locked receiver and has the following characteristics:

1. Noise figure, 15 db
2. Loop noise bandwidth (at threshold), 100 cps
3. Dynamic range, 90 db
4. AGC loop bandwidth, 1 cps
5. Threshold, -139 dbm (at diplexer input)

The first IF is 50 Mc and the second IF is 10 Mc. The receiver AGC voltage and static loop phase error voltages are telemetered to the tracking ground stations as an aid in adjusting the transmitted 890-Mc frequency. The receiver is connected through an L-band diplexer to the omnidirectional antenna. It is never switched to the high-gain antenna.

The transmitter portion of the transponder utilizes the receiver VCO frequency reference in the two-way transponder mode. In the one-way mode, an independent oscillator is switched into the circuit. The 250-mw output of the transponder is amplified to 3 w in each of the two RF amplifiers. One RF amplifier is coupled through a diplexer to the omnidirectional antenna, the other RF amplifier is coupled to the high-gain parabolic antenna through a 10-db directional coupler (which means it is

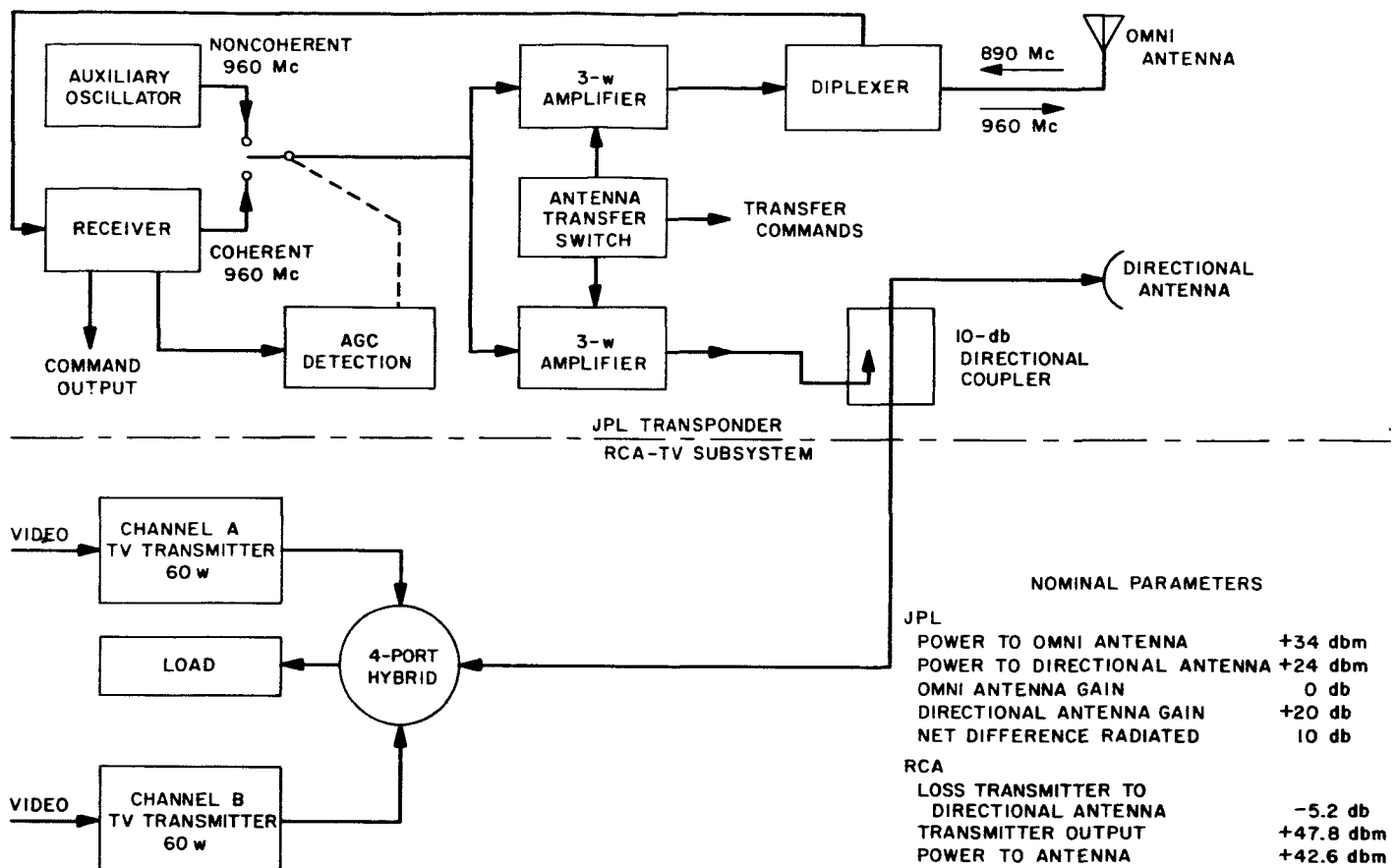


Fig. 10. Spacecraft communications system block diagram

combined with the RCA-TV signal). The signal from either amplifier is sent to the respective antenna by activating its filament circuit. The radiated output is

approximately 3 w on the omnidirectional antenna and 0.3 w on the high-gain parabolic antenna. Figure 10 is a block diagram of the spacecraft communications system.

III. DATA EVALUATION

In the orbit determination program (ODP), the *Ranger 5* spacecraft orbit is determined by locating the set of initial conditions at injection epoch, which causes the weighted sum of the squares of the differences between actual observations and the computed values of the observables to be minimized. The method is called modified weighted least squares because of the method employed in obtaining the weights. In the usual least squares method, the data points are weighted independently, inversely proportional to their expected (or measured) variances. In modified least squares, the independent weighting values are determined by the expected (or measured) *effective variances*. In arriving at the effective variance for each data type at each station, consideration is given to the correlation width of all recognized noise sources, the sampling rates, counting times, elevation angles, and range to the spacecraft. Prior to being put on the ODP input tape, the incoming data goes through a tracking data editing program (TDEP) which rejects gross blunder points, points that are outside the antenna mechanical constraints, and points with bad teletypewriter format. No attempt is made to unscramble or correct bad format points. Therefore, by sacrificing the possibility of utilizing the maximum number of data points, there will be a reduction in the sensitivity to blunder points and possible error points that might otherwise have a significant effect on the orbit. The current policy for weighting data is to assign an initial weight for each data type based on the sample rate, count time, and expected data quality. These weights may be changed (on option) when the sample rate and count time changes or when the residuals indicate periods of extremely good or relatively poor tracking data.

Data evaluation techniques (consistent with the ODP computational methods) have been developed with the goal of isolating and removing systematic errors, and

determining the characteristics of tracking data noise statistics; i.e., the RMS and mean values of the residuals (observed minus computed). The pertinent equations are given in Appendix A. There are essentially two phases in the mission tracking evaluation: (1) inflight, and (2) postflight.

In the inflight phase, station reports are analyzed to detect any unusual occurrences. Also, transmitter VCO drift statistics are compiled, frequency changes are noted and brought to the attention of the ODP group, and changes in transmitter assignments are evaluated. After the orbit is reasonably well known, observed values are checked against predicted values to determine the validity of the tracking data and to detect blunder points before they influence the orbit. Certain parameters such as the doppler system figure of merit (g^2) are computed and used to evaluate the quality of the incoming doppler data. Once the ODP listings are available, the residuals and rejected points are analyzed to detect systematic error sources. The test director is informed of all unusual occurrences, and if applicable, corrective action is recommended.

The postflight evaluation phase consists of analyzing all available data pertaining to the DSIF tracking performance. Complete analysis of all residuals, by data type, is made to detect equipment biases, periodic noise which might be attributed to station equipment, and any other systematic errors. The validity of the noise model is checked by least-squares fitting the tracking data. All observations are evaluated and compared with preflight calibrations and past performance. All indications of equipment problems and nonstandard occurrences are investigated and recommendations are made to the appropriate agencies. New data analysis techniques are investigated and implemented if applicable.

IV. PERFORMANCE ANALYSIS

A. Preflight Calibrations at DSIF Stations

In order to improve the quality of the primary angular data going into the ODP, it is first corrected for the antenna optical pointing error (OPE). For the angle data stations (41 and 51), this error was determined from a series of independent, horizon-to-horizon star tracks. A polynomial curve fit was made to the differences between the refraction corrected ephemeris values and the observed values read from the angle encoders. The OPE is then represented by the coefficients of the resulting polynomials. In general, the preflight calibration star tracks are required for two purposes: (1) to detect gross system errors, and (2) to test the validity of the correction polynomial.

Experience gained from the *Ranger 4* experiment has shown that the OPE coefficients do not remove all systematic pointing errors. This is reasonable since the RF and optical axis of the antenna are not necessarily the same. That is, the RF axis is a function of the position of the quadripod feed, whereas the optical axis is not. Therefore, if there is a quadripod deflection (due to thermal effect and/or gravitational loading) at some given instant of time, the optical error and the RF error would not be the same. Further, the optical refraction and the RF refraction are not the same due to the difference in respective wavelengths. In addition to these effects, the RF pointing error is also a function of feed alignment, received signal-to-noise ratio, and received polarization angle (since the antenna null pattern does not have the same slope at all polarization angles). The RF boresight vs polarization angle test was an attempt to study the RF errors. The test was designed to correlate the optical and RF errors observed at the collimation tower over a range of signal levels and polarization angles. Experience has shown that the results of the test cannot be applied to the inflight data in a meaningful manner. For the purpose of describing the RF pointing error, the test is inadequate and a new method for determining the RF antenna calibration is required. However, the test is required to add to the composite statistical data, and provides a good indication of RF system status and autotrack capabilities.

Appendix B contains the results of boresight vs polarization angle tests and the coefficients used in the real time computation of *Ranger 5*.

The following is an account of the calibration tests conducted for the *Mariner II* mission (used also for the *Ranger 5* mission).

1. Station 59

A boresight vs polarization angle (B/P) test was conducted on July 15, 1962. The test was conducted at polarization angles of 0, 180, and 240 deg for signal strengths of -120 dbm and -140 dbm. The mean error in azimuth exceeded *Rangers 3* and *4* by a factor of 2 and the angle tracking jitter exceeded *Rangers 3* and *4* by a factor of 4. Results of the B/P test are presented in Appendix B. Since angular data from Station 59 are not primary data, the B/P test was considered satisfactory for the *Ranger 5* mission. Star tracks were not conducted by Station 59 because angular data are not considered primary data.

2. Station 11

A star track of Alpha Aquilae (Altair) was conducted on August 3, 1962. Hour angle and declination residuals (observed minus computed) compared favorably with previous star tracks. A plot of the star track is presented in Fig. 11. B/P tests were not required for *Ranger 5*.

3. Station 12

A star track of Alpha Aquilae was conducted on August 8, 1962. Hour angle and declination residuals (observed minus computed) compared favorably with previous star tracks. A plot of the star track is presented in Fig. 12. B/P tests were not required for *Ranger 5*.

4. Station 41

A star track of Alpha Aquilae was conducted on August 16, 1962. A curve generated from a polynomial using the angular correction coefficients compared very favorably with the hour angle and declination residual (observed minus computed) from the star track. Based on the August 16, 1962 star track, the angular correction coefficients determined from the 1961-62 star tracks were considered to be the best estimate of optical pointing error (OPE). A plot of the star track is presented in Fig. 13. The OPE angular correction coefficients are presented in Appendix C.

A B/P test was conducted on July 12, 1962 at signal strengths of -120 , -130 , and -140 dbm. Results compared favorably with previous tests and are presented in Appendix C.

5. Station 51

A star track of Alpha Aquilae was conducted on August 2, 1962. A curve generated from a polynomial

using the angular correction coefficients determined from 1961-62 star tracks compared very favorably with the hour angle residuals; however, the declination residuals were biased approximately -0.01 deg for the entire star track. A second star track of Alpha Aquilae was conducted on August 17, 1962. The hour angle residuals from this star track again agreed favorably with the curve generated from the polynomial using the angular correc-

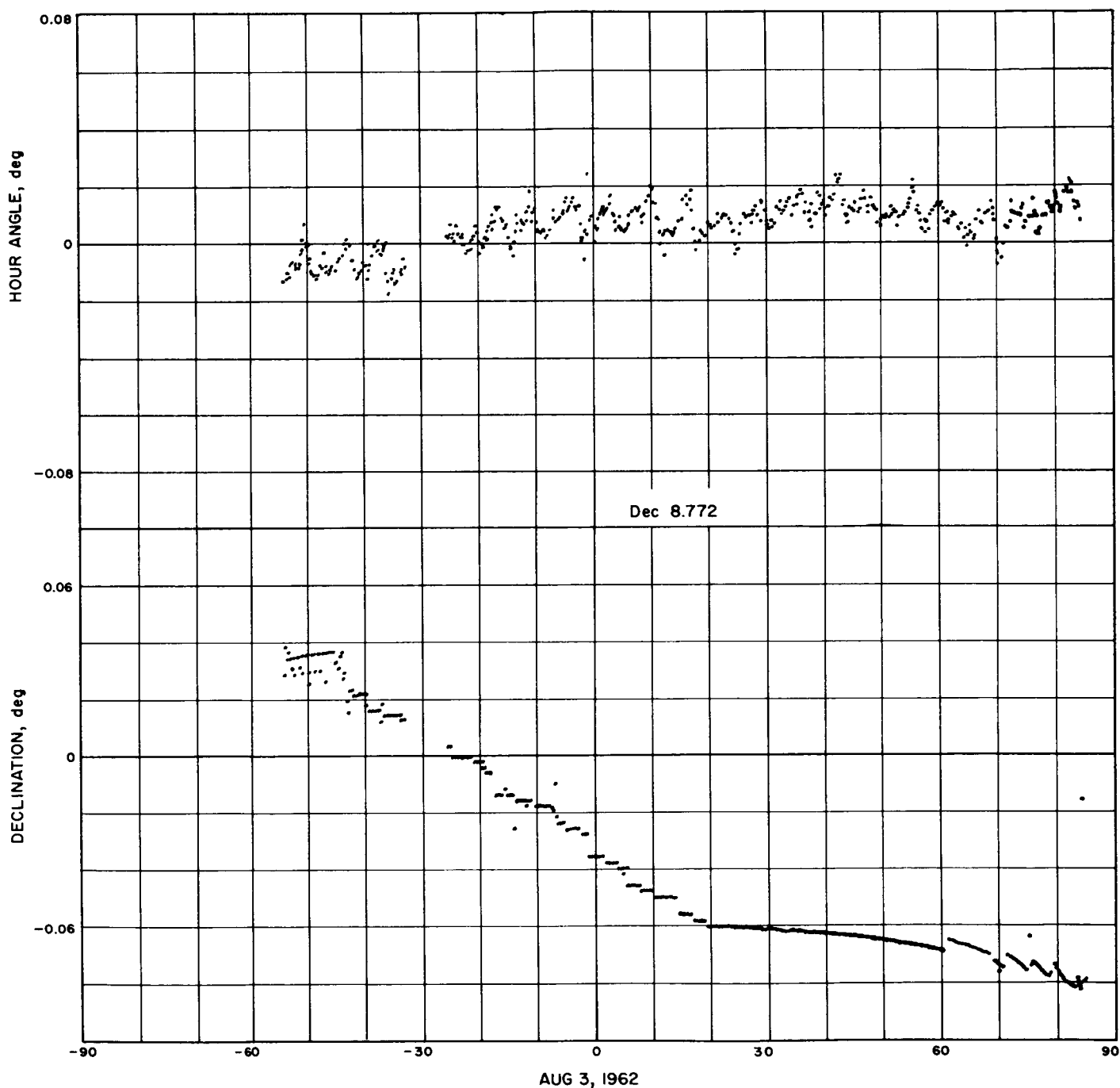


Fig. 11. Star track of Alpha Aquilae, Aug 3, 1962

tion coefficients. Declination residuals for $-30 < HA < 30$ agreed with the polynomial. Film data were not taken to verify that the star was centered during these tracks. A decision was made to use the angular correction coefficients from the 1961-62 star tracks for the *Ranger 5* mis-

sion. Plots of results of the star tracks are presented in Figs. 14 and 15.

A B/P test was conducted on August 10, 1962 at signal strengths of -120 , -130 , and -140 dbm. The results

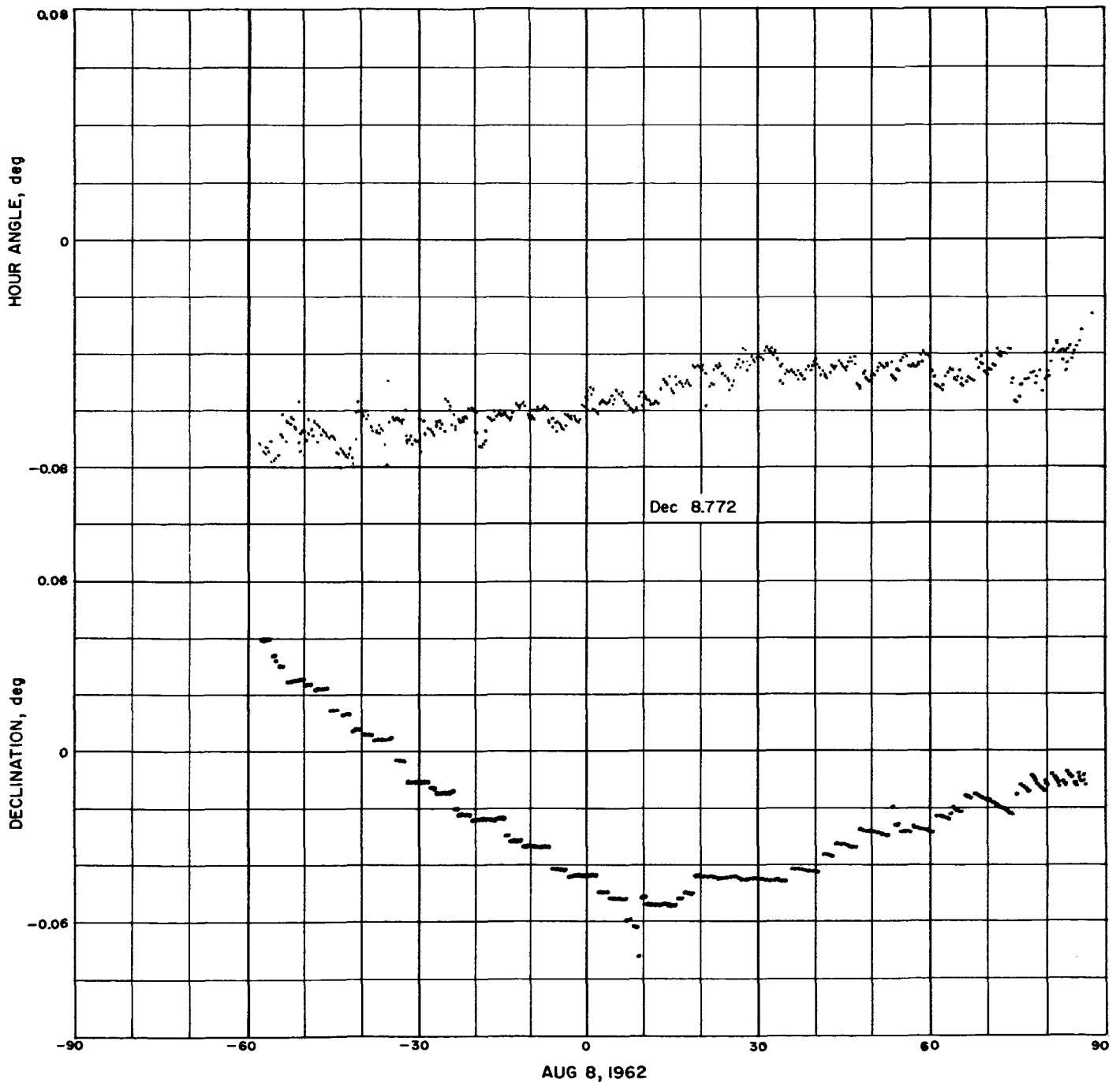


Fig. 12. Star track of Alpha Aquilae, Aug 8, 1962

agreed favorably with previous tests and are presented in Appendix C.

B. DSIF Station Performance Analysis

The DSIF stations tracked *Ranger 5* continuously from acquisition by Station 41 at 17:45:37 GMT on October 18, 1962 until shutdown at Station 2 on October 30, 1962.

This Report analyzes tracking data from 17:45 October 18, to October 23. Table 6 contains a summary of the data used in the ODP. Appendix A contains listings of the transmitter VCO frequencies. Appendix D contains the residual plots from the ODP.

The angular data from Station 4 were considered poor. This problem is covered in detail later. Station 5 data were good. Doppler data were good.

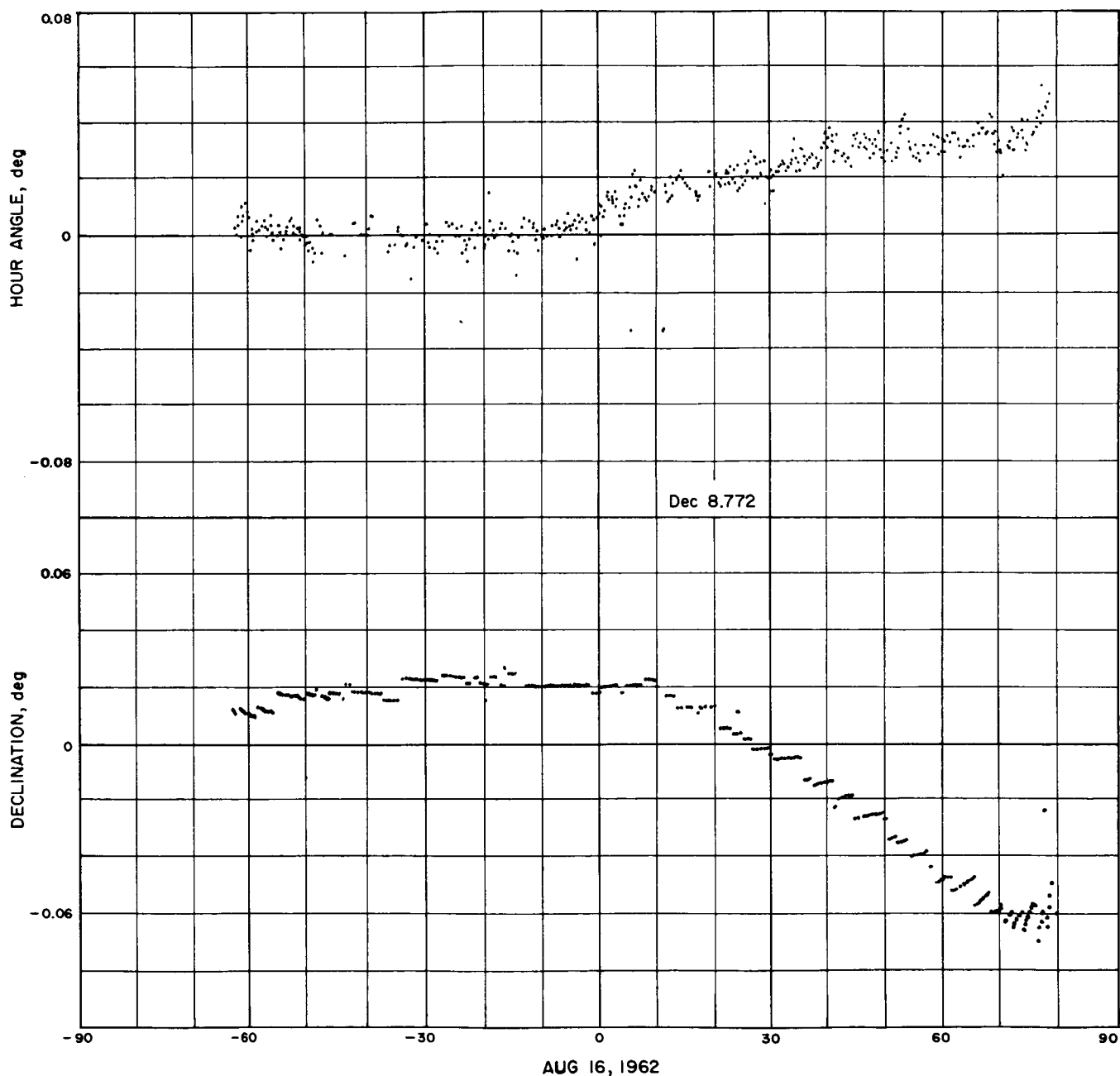


Fig. 13. Star track of Alpha Aquilae, Aug. 16, 1962

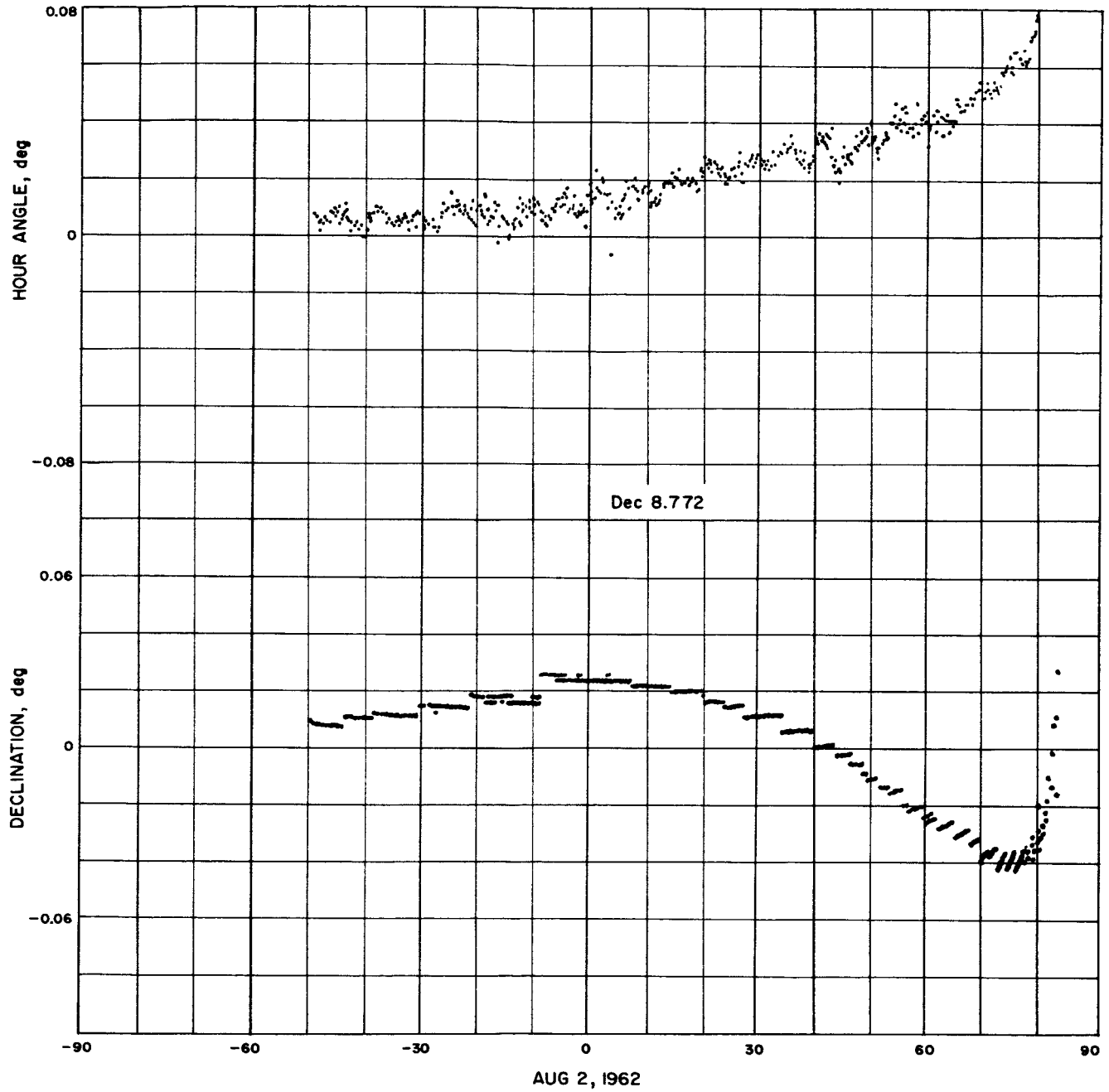


Fig. 14. Star track of Alpha Aquilae, Aug. 2, 1962

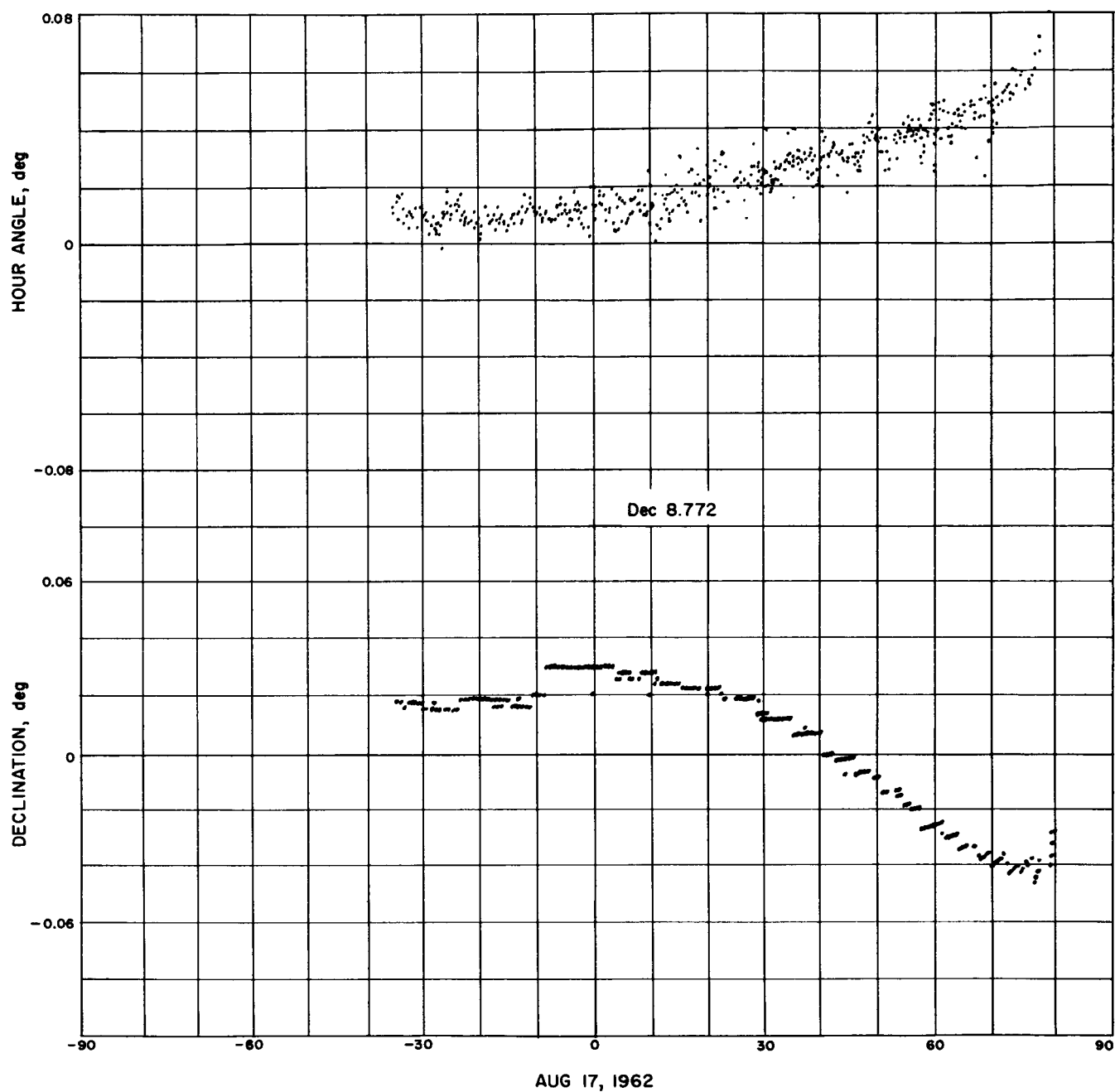


Fig. 15. Star track of Alpha Aquilae, Aug. 17, 1962

Table 6. ODP statistics

Pass No.	Data type	Date/Beginning time, GMT	Date/End time, GMT	Number of points	Standard deviation	RMS	Mean
Station 41							
10/181	Pseudo 2-way doppler	10/19-01:17:28	10/19-01:33:03	68	3.5	10.6	-10
	2-way doppler	10/18-18:39:26	10/18-23:27:26	213	0.0219	0.0224	0.00467
	HA	10/18-18:39:51	10/19-01:10:44	238	0.0372	0.0831	-0.0744
	Dec	10/18-18:39:51	10/19-01:10:44	285	0.0135	0.0269	-0.0232
10/192	HA	10/19-18:15:02	10/20-01:58:02	18	0.0622	0.0624	-0.00444
	Dec	10/19-18:15:02	10/20-01:58:02	20	0.0247	0.0398	-0.0312
10/203	HA	10/20-17:26:11	10/21-02:11:31	597	0.0753	0.0763	0.0118
	Dec	10/20-17:26:11	10/21-02:11:31	797	0.0522	0.0711	-0.0489
10/214	HA	10/21-18:36:04	10/22-02:35:54	368	0.0825	0.0838	0.0144
	Dec	10/21-18:36:04	10/22-02:35:54	677	0.073	0.0843	0.0423
Station 51 ^a							
10/181	HA	10/18-23:23:02	10/19-06:25:02	313	0.0143	0.0002	-0.0027
	Dec	10/18-23:23:02	10/19-06:25:02	312	0.0245	0.0006	0.0056
10/192	HA	10/20-03:34:02	10/20-08:45:02	15	0.0362	0.0013	0.0202
	Dec	10/20-03:34:02	10/20-08:45:02	15	0.0271	0.0007	0.0336
10/213	HA	10/21-00:42:42	10/19-09:43:22	570	0.0397	0.0016	0.0118
	Dec	10/21-00:42:42	10/19-09:43:22	557	0.0437	0.0019	-0.0037
10/224	HA	10/21-06:12:52	10/21-07:28:52	85	0.0398	0.0016	0.258
	Dec	10/21-06:12:52	10/21-07:28:52	77	0.0572	0.0033	0.0912
Day 291 g ²		Station 59 5.85		Station 41 8.41		Station 51 0.06	

^aThe ODP statistics did not include Station 51. A program for the IBM 1620 at Goldstone, California was used to calculate this. Rejection points were set at 0.05.

1. Station 59

Pass No. 1 (October 18, 1962, 17:31:25 to 17:36:55 GMT). Good two-way doppler data were received at a 5-sec sample rate and 5-sec continuous doppler count. Signal level was -140 dbm.

Pass No. 2 (October 18, 1962, 22:31:00 to October 19, 1962, 07:52:01 GMT). This station acted as a receiver only in the one-way doppler mode for Pass No. 2. Raw data were recorded from day 292 (01:17:28 to 01:43:01 GMT). The receiver went out of lock at 01:29:50 and continued tracking intermittently thereafter.

2. Station 41

Pass No. 1 (October 18, 1962, 17:45:39 to October 19, 1962, 02:20:00 GMT). Good two-way lock was not achieved until 18:35:30 because the transmitter VCO was not tuned properly. Time was spent in searching pseudo-lock areas. Two-way lock continued until approximately 23:30, October 18, 1962, when Station 51 picked up two-way lock. Station 41 tracked the transponder signal, except for a short capsule tracking period from 01:14 to 01:21, October 19, when the transponder signal went below receiver threshold. Capsule tracking resumed at 01:58 and continued until 02:20:11 when the receiver

went out of lock. Station 41 had a transmitter VCO drift at 20:22:11 because of air-conditioning system problems.

Declination residuals showed a bias of $+0.05$ deg throughout the entire pass. An apparent sinusoid with a peak-to-peak difference of 0.04 deg and a period of 5 min was evident. This was probably caused by antenna hitch-

ing. Hour angle data on the first pass were all poor, as shown by a least-squares-curve fit on the raw data. Comparison to a least-squares-curve fit for *Mariner II* data shows this very vividly (see Figs. 16 and 17). An operational error was probably committed (as indicated in the Station Report), because the RF error gain was set too low. The doppler data were satisfactory.

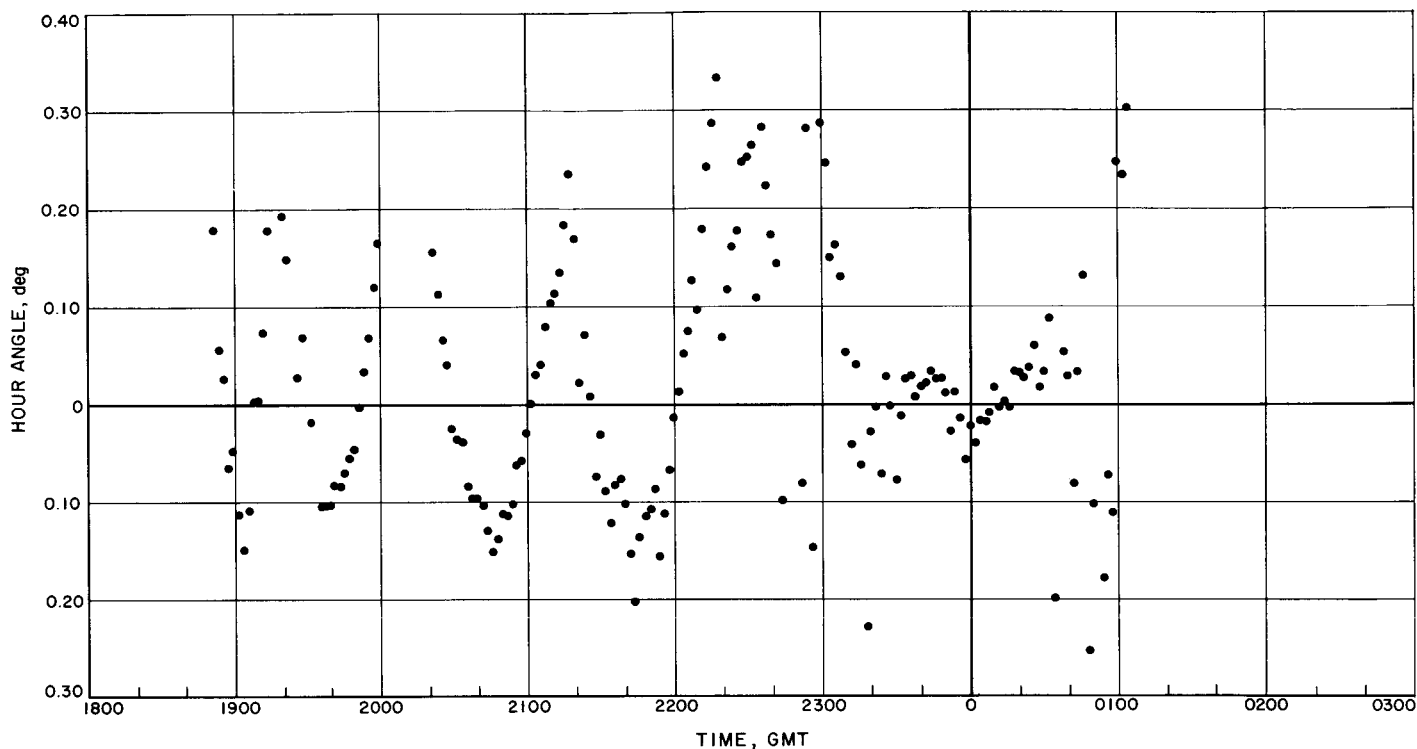


Fig. 16. Least-squares fitted raw data, *Ranger 5* (Station 41, Oct 18, 1962)

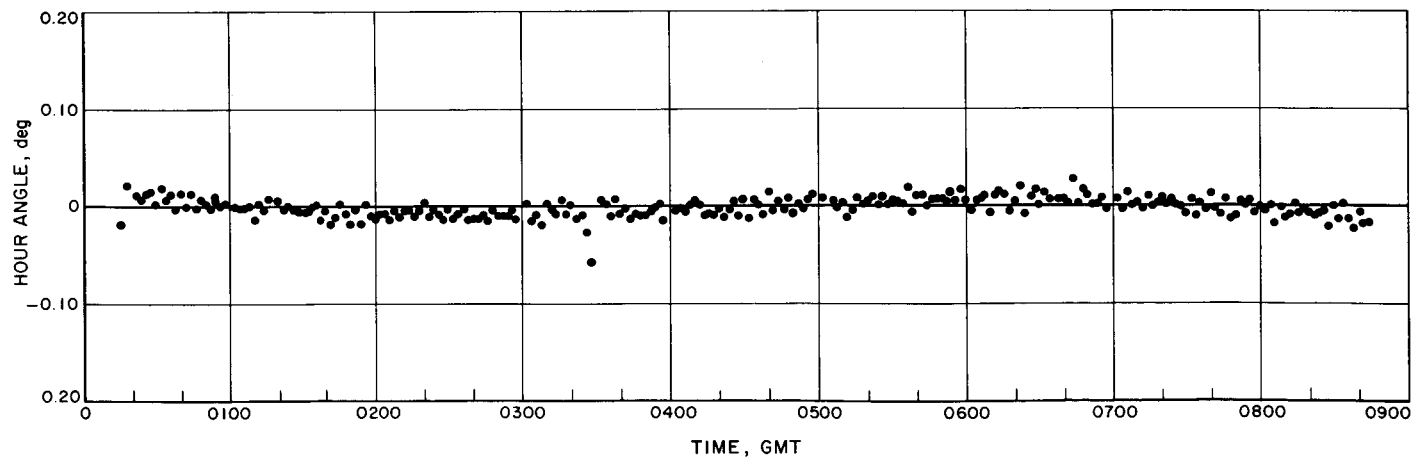


Fig. 17. Least-squares fitted raw data, *Mariner II* (Station 41, Oct 18, 1962)

Pass No. 2 (October 19, 1962, 16:51:41 to 19:23:00 GMT). During this pass, tracking was alternated between transponder and capsule beacon. Angle data were good during the short periods recovered (see Appendix B). Doppler data were unusable in the ODP, although the raw data show a good condition code.

Pass No. 3 (October 20, 1962, 16:59:11 to 20:45:51 GMT). These data showed a large amount of scatter. This is normal because the signal strength was so low.

Pass No. 4 (October 21, 1962, 00:42:02 to 08:45:00 GMT). These data also showed a large amount of scatter, and can be attributed to the low signal strength.

3. Station 51

Pass No. 1 (October 18, 1962, 17:32 to 17:35 GMT). The station was in intermittent lock during this pass and no data were acquired. There was no lock on the main antenna (probably due to the acquisition antenna pattern being distorted by ground reflections).

Pass No. 2 (October 18, 1962, 23:00:02 to October 19, 1962, 06:53:02 GMT). Acquisition occurred at 22:58:05 with -132 -dbm signal strengths. During this pass the midcourse maneuver was attempted. Commands were sent by Station 51. All residuals were good.

Pass No. 3 (October 20, 1962, 00:37:40 to 10:00:00 GMT). All data were good, although there was some scattering due to low signal strength.

Pass No. 4 (October 21, 1962, 00:34:29 to 10:00:00 GMT). Angular data were good but scattered. The receiver was in intermittent lock from 05:50 to 08:50 GMT. A check of the raw data shows the doppler counter recycling at unpredictable times.

Pass No. 5 (October 22, 1962, 06:12:05 to 07:30:00 GMT). This station secured on October 22, 1962. A large bias of $+0.25$ deg was evident in Hour Angle. Declination showed an increasing positive bias of $+0.1$ to $+0.2$ deg.

4. Station 11

Station 11 tracked one-way doppler during its tracking periods. None of the data was used in the ODP. Due to

the loss of power, all signal strengths were near threshold and the receiver went in and out of lock. Tracking was normal on a comparative basis. This station continued its tracking until *Ranger 5* tracking was terminated on October 30, 1962. See Table 7 for a summary of capsule beacon tracking.

5. Station 12

Station 12 also tracked one-way doppler during its tracking periods. No data were used in the ODP. Signal

Table 7. Summary of capsule beacon tracking

Date	Station	Acquisition, GMT	End of track, GMT
October 19, 1962	41	01:19:00	01:22:14
	41	01:58:32	02:26:50
	41	16:35:00	02:30:00 ^a
	51	02:36:40	04:00:00
	51	04:35:00	04:44:00
	11	08:35:00	14:39:02
	12	08:46:00	08:50:12
	12	15:32:00	17:05:00
October 20, 1962	12	18:54:30	19:08:20
	41	17:08:00	02:44:11 ^a
	51	00:37:40	10:00:00
October 21, 1962	12	10:19:00	20:30:00
	41	18:25:52	02:40:00 ^a
	51	00:10:00	09:00:10
	11	08:53:00	16:38:16.1 ^b
	11	17:44:58.4 ^c	20:45:00
October 22, 1962	12	17:47:50	18:14:00
	51	05:30:00	07:30:00
October 23-29, 1962	11	19:04:00	20:15:00
	11 ^d		
^a End of track occurs on next day. ^b Occultation time. ^c Reacquisition time after occultation. ^d Station tracked for approximately 2 hr each day.			

strengths were very weak due to the loss of spacecraft power. Receiver continually went in and out of lock, usually with the capsule beacon (see Table 7 for capsule beacon tracking periods). An attempt was made to send an RTC-3 command during the third pass with no success.

C. Transmitter VCO Drift

Transmitter VCO for Station 51 was very stable during the first pass. Only the first pass was analyzed. The transmitter VCO drift rate for Station 41 was very high due to an air-conditioning problem (9 cps/hr from GMT 2020 to 2050). Beginning at 2050, the drift rate slowly stabilized. It was 1.7 cps/hr between GMT 2050 to 2340.

Table 6 presents results of the g^2 computation:

$$g^2 = K \sum (\Delta f_r)^2$$

$$K = \frac{1}{T_{\text{tot}} (f_r)^2 B^*}$$

where f_r = transmitter VCO frequency

$$B^* = 1.4 \times 10^{-18}$$

T_{tot} = time interval over which $\sum (\Delta f_r)^2$ is determined

APPENDIX A

Equations Used in Data Evaluation

The following equations, contributed by T. W. Hamilton, are used for inflight evaluation of the two-way doppler data:

$$\sigma^2 = (0.40)^2 \frac{10}{T_s} + \frac{1}{3} \left(\frac{1}{T_c} \right)^2 + \left(\frac{R}{4 \times 10^5} \right)^2 \left(\frac{10}{T_s} \right) (g^2)$$

where g^2 = doppler system figure of merit

R = slant range of spacecraft, km

T_c = doppler averaging time

T_s = sample interval

The first term on the right is an estimate of the variance due to gaining or losing a cycle in either the ground receiver or the spacecraft receiver in a random fashion due to noise, and noise on the signal due to the transmission medium. The second term is an estimate of the variance due to doppler counter round-off, and the third

term is the variance due to transmitter reference oscillator drift. The equation used to compute g^2 is

$$g^2 = K \sum (\Delta f_r)^2$$

$$\text{where } K = \frac{1}{T_{\text{tot}} (f_r)^2 B^*}$$

$$B^* = 1.4 \times 10^{-18} \text{ sec}^{-1}$$

$$f_r = \text{transmitter VCO frequency} \\ = 29.668212 \times 10^6 \text{ cps}$$

$$T_{\text{tot}} = \text{time interval over which } (\Delta f_r)^2 \text{ is determined}$$

DSIF station transmitter VCO frequencies are listed in Table A-1.

Table A-1. Transmitter VCO frequencies

DSIF station	Date	Transmitter on, GMT	Transmitter off, GMT	VCO frequency, cps	DSIF station	Date	Transmitter on, GMT	Transmitter off, GMT	VCO frequency, cps
59	October 18, 1962	17:30:28		29668211.2	41	October 18, 1962	19:27:00		
		17:31:36		29668211.4			19:32:11		29668276.5
		17:32:36		29668211.3			19:37:11		29668276.6
		17:33:36		29668211.3			19:42:11		29668276.5
		17:34:36		29668211.2			19:47:11		29668276.5
		17:35:36		29668211.2			19:52:11		29668276.4
		17:36:36		29668211.2			19:57:11		29668276.4
		17:37:36		29668211.2			20:02:11		29668276.3
		17:38:36		29668211.2			20:07:11		29668276.3
		17:39:36		29668211.3			20:12:11		29668276.3
41	October 18, 1962	18:40:12		29668913.1			20:17:11		29668276.3
		18:45:12		29668912.5			20:22:11		29668276.2
		18:50:12		29668912.2			20:27:11		29668275.9
		18:55:12		29668911.9			20:32:11		29668275.5
			19:07:40	29668911.9			20:37:11		29668274.5

Table A-1. (Cont'd)

DSIF station	Date	Transmitter on, GMT	Transmitter off, GMT	VCO frequency, cps	DSIF station	Date	Transmitter on, GMT	Transmitter off, GMT	VCO frequency, cps
41	October 18, 1962	20:52:11		29668272.1	41	October 18, 1962	23:07:01		29668275.7
		20:42:11		29668273.7			23:12:01		29668275.7
		20:47:11		29668272.9			23:17:01		29668275.9
		20:57:01		29668271.9			23:22:01		29668276.2
		21:02:01		29668271.8			23:27:01		29668276.2
		21:07:01		29668271.9			23:32:01		29668276.5
		21:12:01		29668272.1			23:37:01		29668276.6
		21:17:01		29668272.3				23:40:00	
		21:22:01		29668272.6	51	October 18, 1962	23:30:35		29668379.2
		21:27:01		29668272.7			23:38:01		29668379.5
		21:32:01		29668272.8			23:42:21		29668379.3
		21:37:01		29668273.1			23:48:20		29668379.3
		21:42:01		29668273.3			23:53:20		29668379.2
		21:47:01		29668273.3			23:58:20		29668379.3
		21:52:01		29668273.6		October 19, 1962	00:03:00		29668379.3
		21:57:01		29668273.8			00:08:00		29668379.4
		22:02:01		29668274.1			00:13:00		29668379.3
		22:07:01		29668274.1			00:18:00		29668379.3
		22:12:01		29668274.1			00:23:00		29668379.2
		22:17:01		29668274.4			00:28:00		29668379.2
		22:22:01		29668274.5			00:33:00		29668379.3
		22:27:01		29668274.4			00:38:00		29668379.4
		22:32:01		29668274.7			00:43:00		29668379.3
		22:37:01		29668275.1			00:48:00		29668379.5
		22:42:01		29668275.2			00:53:00		29668379.5
		22:47:01		29668275.5			00:58:00		29668379.1
		22:52:01		29668275.7			01:03:00		29668379.0
		22:57:01		29668275.7			01:08:00		29668379.1
		23:02:01		29668275.7			01:13:00		29668378.8
							01:18:00		29668378.8
							01:23:00		29668378.9
							01:28:00 ^a		29668378.9
							01:38:49		29668045.8
^a Battery power became so weak that sudden loss of signal occurred at 01:29:41 and tracking was intermittent from then on. Battery went dead at approximately 01:45.									

The following is the form of the autocorrelation function used to determine whether the tracking data noise is of a random nature:

$$\rho(k) = \frac{1}{(N-k)\rho(0)} \sum_{i=1}^{N-k} r_i r_{i+k}$$

$$k = 1, 2, \dots, (2/3 N)$$

where r_i = the i th residual

N = the total number of data points used

k = a dummy index related to time; i.e.,
 $t_k = (t_0 + k\Delta t)$ where Δt is the
sample interval

$(2/3 N)$ = the largest integer in $2/3 N$

$\rho(k)$ = the autocorrelation coefficient of
the k th order

APPENDIX B

Boresight vs Polarization Tests

Results of the B/P tests are listed in Table B-1. The mean error and standard deviation were computed for all polarization angles at each signal strength.

Listed below are the systematic angular error coefficients for Stations 41 and 51.

Table B-1. Boresight vs polarization

DSIF station		Signal strength		
		- 120 dbm	- 130 dbm	- 140 dbm
59	Az Mean error	0.229	—	0.205
	Az Standard deviation	0.224	—	0.165
	El Mean error	-0.070	—	0.080
	El Standard deviation	-0.096	—	0.124
41	HA Mean error	0.052	0.016	0.046
	HA Standard deviation	0.010	0.035	0.045
	Dec Mean error	0.046	0.068	0.047
	Dec Standard deviation	0.004	0.025	0.028
51	HA Mean error	-0.024	-0.028	-0.033
	HA Standard deviation	0.016	0.016	0.017
	Dec Mean error	-0.003	-0.006	-0.033
	Dec Standard deviation	0.005	0.004	0.006

Station 41

$$A_{00} = 8.1782221 \times 10^{-2} \quad B_{00} = 7.7083567 \times 10^{-2}$$

$$A_{01} = 5.4528942 \times 10^{-4} \quad B_{01} = 1.3421492 \times 10^{-4}$$

$$A_{02} = 2.4824958 \times 10^{-6} \quad B_{02} = -1.4110890 \times 10^{-5}$$

$$A_{03} = 2.2456691 \times 10^{-7} \quad B_{03} = 0$$

$$A_{10} = 3.9893420 \times 10^{-5} \quad B_{10} = -3.7604920 \times 10^{-4}$$

$$A_{11} = 8.6958410 \times 10^{-6} \quad B_{11} = 3.3477154 \times 10^{-6}$$

$$A_{12} = -6.5207442 \times 10^{-7} \quad B_{12} = 1.0189521 \times 10^{-7}$$

$$A_{13} = -1.5949038 \times 10^{-8} \quad B_{13} = 0$$

$$A_{20} = -1.2946369 \times 10^{-6} \quad B_{20} = -8.8803999 \times 10^{-6}$$

$$A_{21} = -7.8951151 \times 10^{-8} \quad B_{21} = 4.5394206 \times 10^{-9}$$

$$A_{22} = -7.0411608 \times 10^{-9} \quad B_{22} = 2.0957802 \times 10^{-9}$$

$$A_{23} = -1.2359545 \times 10^{-10} \quad B_{23} = 0$$

$$A_{30} = -2.1632630 \times 10^{-7} \quad B_{30} = 0$$

$$A_{31} = 1.9051375 \times 10^{-9} \quad B_{31} = 0$$

$$A_{32} = 3.9524832 \times 10^{-10} \quad B_{32} = 0$$

$$A_{33} = 9.5775121 \times 10^{-12} \quad B_{33} = 0$$

Station 51

$$A_{00} = 3.1611876 \times 10^{-2} \quad B_{00} = 1.6582344 \times 10^{-2}$$

$$A_{01} = 1.5852843 \times 10^{-4} \quad B_{01} = 1.0443459 \times 10^{-4}$$

$$A_{02} = 6.2453096 \times 10^{-6} \quad B_{02} = -3.6495579 \times 10^{-6}$$

$$A_{03} = 3.4384273 \times 10^{-7} \quad B_{03} = 2.0183882 \times 10^{-7}$$

$$A_{10} = -2.7103299 \times 10^{-4} \quad B_{10} = -2.082922 \times 10^{-4}$$

$$A_{11} = 9.3636995 \times 10^{-6} \quad B_{11} = 4.5503798 \times 10^{-6}$$

$$A_{12} = -3.4191398 \times 10^{-7} \quad B_{12} = -9.4572764 \times 10^{-8}$$

$$A_{13} = -3.7665906 \times 10^{-9} \quad B_{13} = -7.1265086 \times 10^{-9}$$

$$A_{20} = -2.3512765 \times 10^{-6} \quad B_{20} = -7.1265086 \times 10^{-6}$$

$$A_{21} = -1.0353745 \times 10^{-8} \quad B_{21} = 5.8977874 \times 10^{-8}$$

$$A_{22} = -3.0418727 \times 10^{-9} \quad B_{22} = 3.6280184 \times 10^{-9}$$

$$A_{23} = -1.5236838 \times 10^{-11} \quad B_{23} = -5.16557298 \times 10^{-11}$$

$$A_{30} = -1.2431192 \times 10^{-7} \quad B_{30} = 0$$

$$A_{31} = 6.2245085 \times 10^{-10} \quad B_{31} = 0$$

$$A_{32} = 1.7992403 \times 10^{-10} \quad B_{32} = 0$$

$$A_{33} = 3.3140295 \times 10^{-12} \quad B_{33} = 0$$

The useful range of these functions is $-70 \text{ deg} \leq \alpha \leq +70 \text{ deg}$, $-35 \text{ deg} \leq \delta \leq +35 \text{ deg}$. These coefficients are obtained from a polynomial curve fit made to the difference between the refraction corrected ephemeris values and the observed values. These coefficients are used to improve the quality of the data by first correcting for the antenna optical pointing errors. The recommended correction equations $D\alpha$ and $D\delta$ are to be used as follows:

$$D\alpha = A_{i,j} \alpha^i \delta^j, \text{ deg}$$

$$D\delta = B_{i,j} \alpha^i \delta^j, \text{ deg}$$

APPENDIX C

Received Frequency Equations

The DSIF receiver is shown as a block diagram in Fig. C-1. The value $f_{s/c}$ is the spacecraft transmitted frequency. f_{rc} is the received carrier frequency, and f_v is the

receiver VCO frequency. In Fig. C-2 the receiver block of Fig. C-1 is expanded into a block diagram valid for all receive modes. r_R is the radial velocity from the receiving

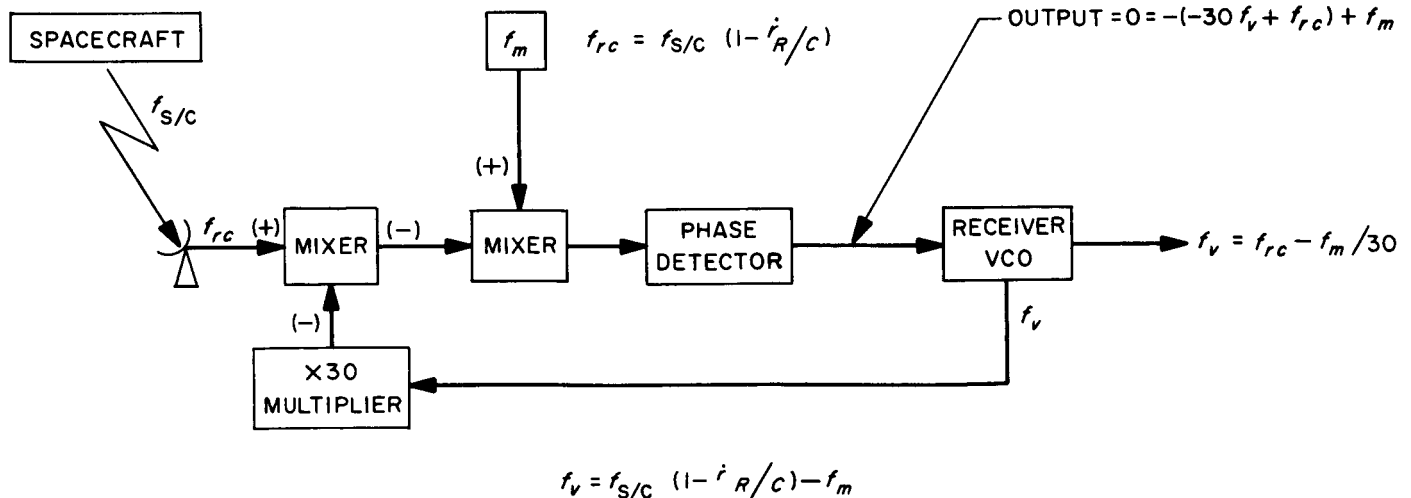


Fig. C-1. DSIF receiver, doppler block diagram

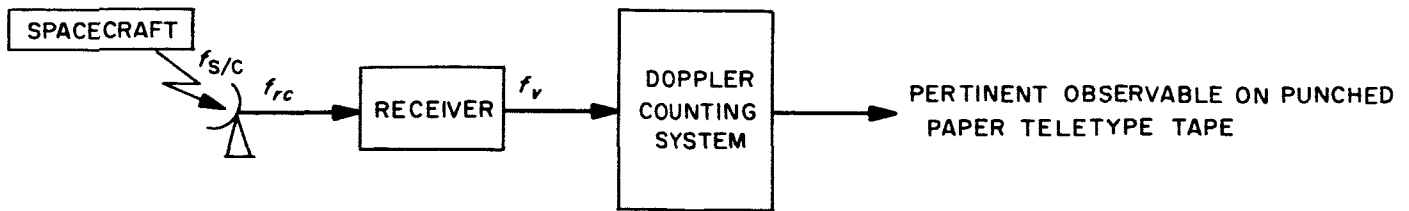


Fig. C-2. Receiver diagram for all receiver modes

station to the spacecraft. f_m is the mixer frequency, a conceptual convenience. C is the speed of light. The units of frequency are megacycles.

Table C-1 lists definitions necessary to particularize the model to a given receive mode.

In Fig. C-3 the doppler counting system block of Fig. C-1 is expanded.

D_j is the doppler detector output. c_j is the pertinent observable on punched paper teletype tape. K_1 is a convenience to generalize the block diagram. It takes on two values as listed in Table C-2.

For ease of use in the various computer programs used during a tracking mission, the equations for c_j are rearranged according to Table C-3.

Table C-1. Definitions to particularize receiver to a given receive mode

Mode	Definition	Remarks
DSIF 1-way	$f_{s/c} = 960.05 \text{ Mc (nominal)}$ $f_m = \frac{30}{31} f_v$	$f_{s/c}$ is the 1-way transponder frequency, sometimes labeled f_T .
DSIF 2-way, 2-station (noncoherent)	$f_{s/c} = (30) \frac{(96)}{(89)} f_{r_T} \left(1 - \frac{r_T}{C} \right)$ $f_m = \frac{30}{31} f_v$	f_{r_T} is the reference oscillator at the transmitting station, nominally 29.668212 Mc. r_T is range rate at the transmitter station.
MTS 1-way	$f_{s/c} = 960.05 \text{ Mc}$ $f_m = \frac{30}{29 \frac{2}{3}} f_{r_R}$	f_{r_R} is the reference oscillator frequency, nominally 29.668212 Mc.
MTS 2-way, 2-station (noncoherent)	$f_{s/c} = (30) \frac{(96)}{(89)} f_{r_T} \left(1 - \frac{r_T}{C} \right)$ $f_m = \frac{30}{29 \frac{2}{3}} f_{r_R}$	
All stations 2-way, 2-station coherent	$f_{s/c} = (30) \frac{(96)}{(89)} f_{r_T} \left(1 - \frac{r_T}{C} \right)$ $f_m = \frac{30}{29 \frac{2}{3}} f_{r_R}$	In this case the transmitter and the receiver are identical or coherent.

All equations for detector output (D) used in the predictions are derived from the relationship

$$D_j = \frac{C_j}{30}, \text{ with } T_c = 0$$

Table C-2. Definition of K_1

Mode	Definition
All 1-way and 2-way, 2-station noncoherent modes	$K_1 = 31.005$
All 2-way and 2-way, 2-station coherent modes	$K_1 = \left[\frac{31}{29 \frac{2}{3}} \frac{f_{rR}}{f_s} + \frac{1}{300} \right]$

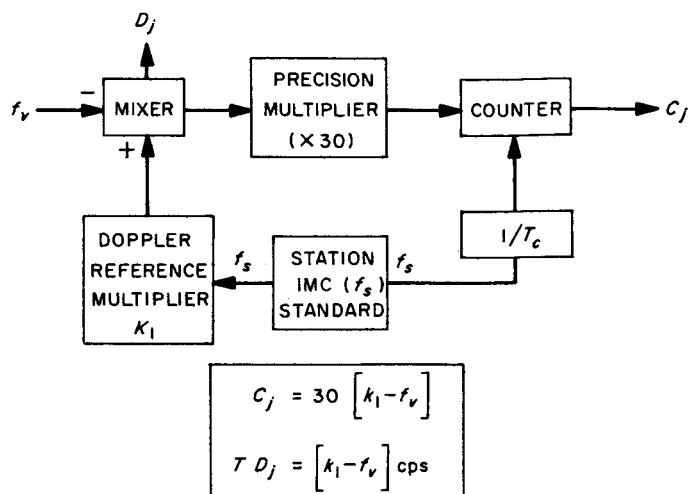


Fig. C-3. Doppler counting system diagram

Table C-3. Equations for $T_c C_j$

Mode	Equation for $T_c C_j$, Mc
DSIF 1-way	$C_1 = \left[930.15 - \frac{31}{32} (960.05) \left(1 - \frac{r_R}{C} \right) \right] T_c$
DSIF 2-way, 2-station (noncoherent)	$C_3 = \left[930.15 - (30) \left(\frac{31}{32} \right) \left(\frac{96}{89} \right) \left(1 - \frac{r_T}{C} \right) \left(1 - \frac{r_R}{C} \right) f_{rT}^* \right] T_c$
MTS 1-way	$C_1 = \left[930.15 + \frac{30}{29 \frac{2}{3}} f_{rR} - 960.05 \left(1 - \frac{r_R}{C} \right) \right] T_c$
MTS 2-way, 2-station (noncoherent)	$C_3 = \left[930.15 + \frac{30}{29 \frac{2}{3}} f_{rR} - (30) \left(\frac{96}{89} \right) \left(1 - \frac{r_T}{C} \right) \left(1 - \frac{r_R}{C} \right) f_{rT}^* \right] T_c$
All stations 2-way and 2-way, 2-station (coherent)	$C_2 = \left[(30) \left(\frac{96}{89} \right) f_{rR} \left(\frac{2R_R}{C} \right) + 0.1 \right] T_c$
*Note that $\left(1 - \frac{r_x}{C} \right) \left(1 - \frac{r_y}{C} \right) = 1 - \frac{r_x + r_y}{C}$	

APPENDIX D**Residuals**

Station residuals are shown in Figs. D-1 through D-11.

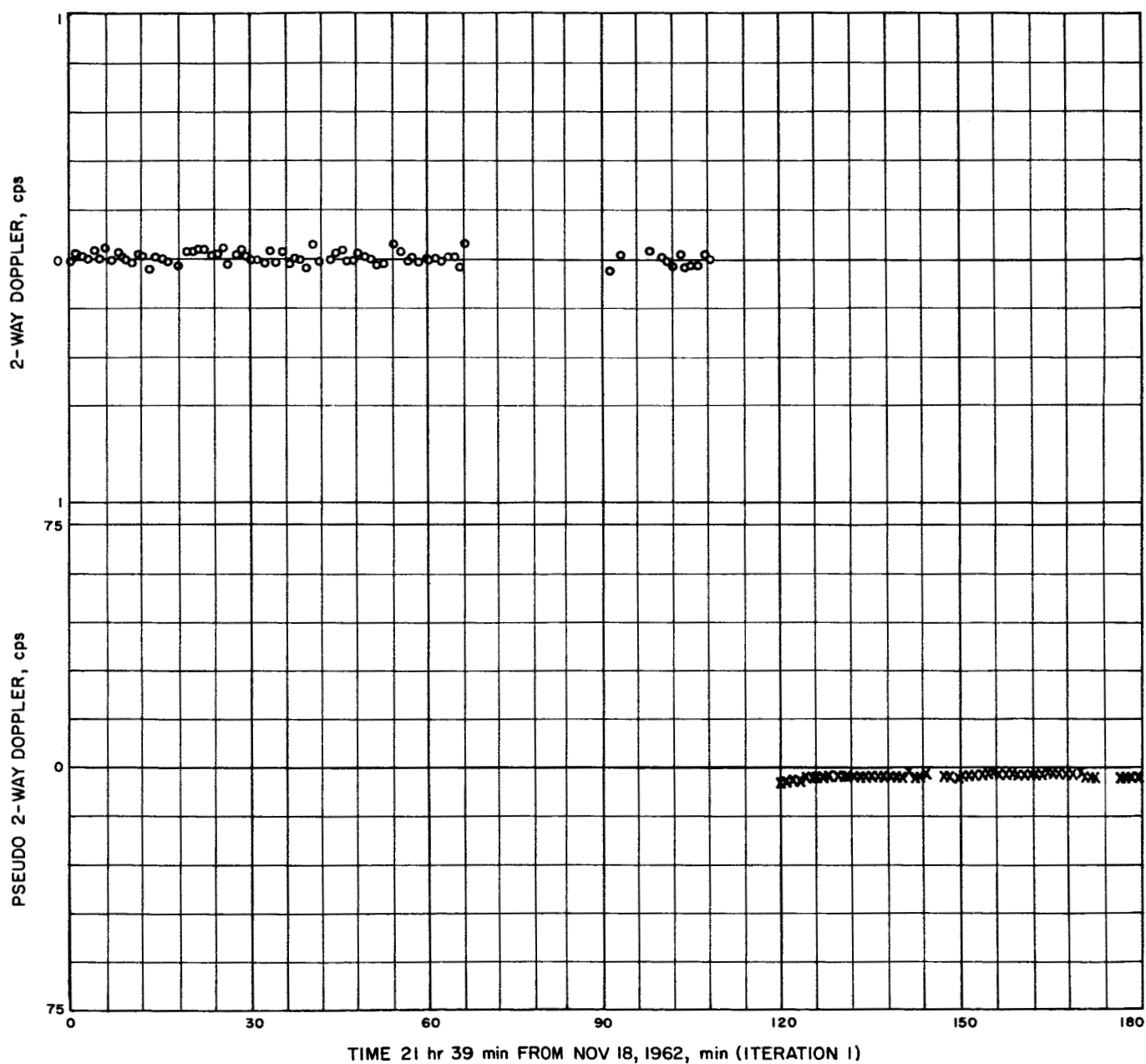


Fig. D-1. Station 41 pass No. 10/181 residuals (21:39 GMT)

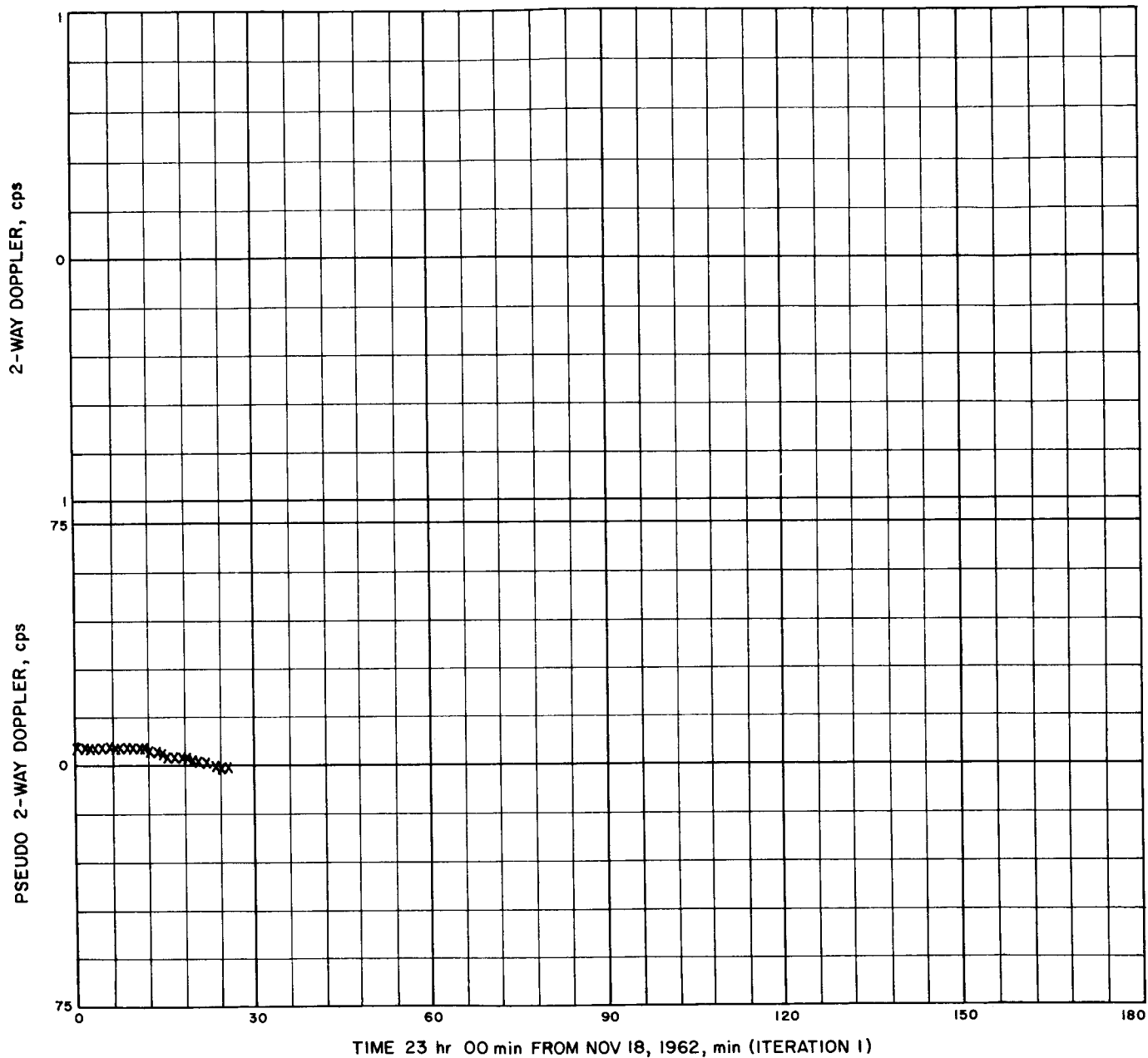


Fig. D-2. Station 51 pass No. 10/181 residuals (23:00 GMT)

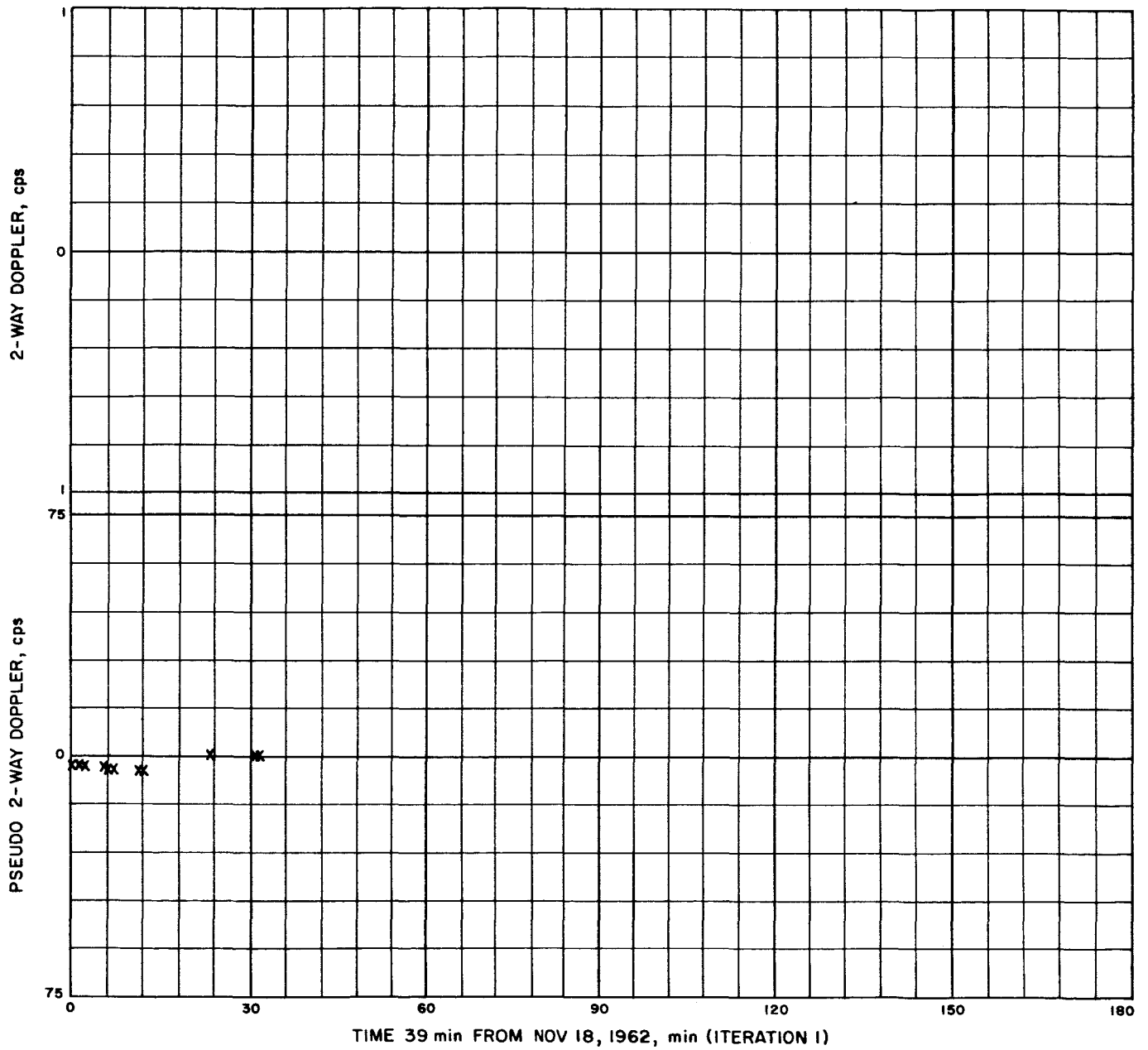


Fig. D-3. Station 41 pass No. 10/181 residuals (0:39 GMT)

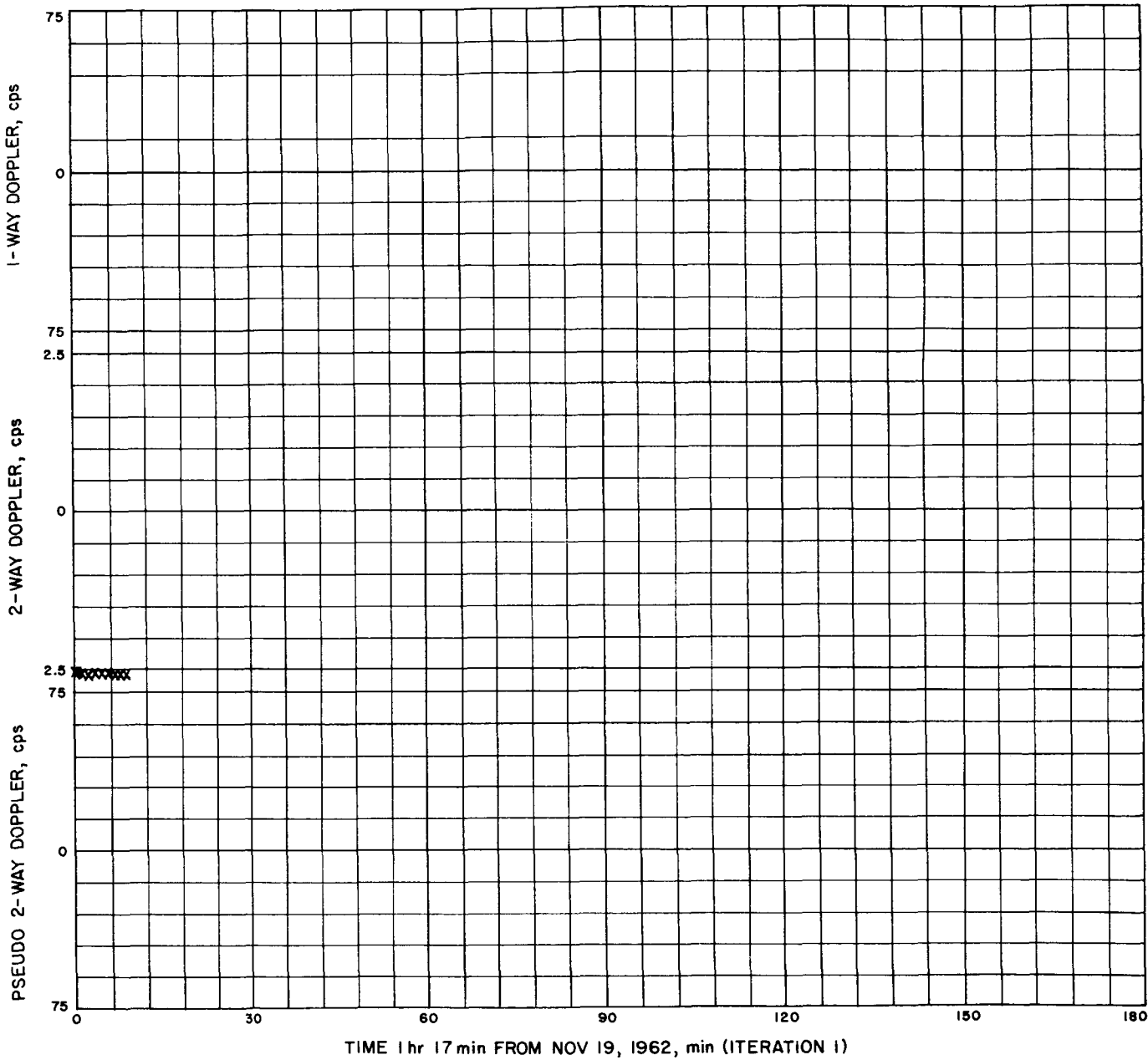


Fig. D-4. Station 59 pass No. 10/191 residuals (1:17 GMT)

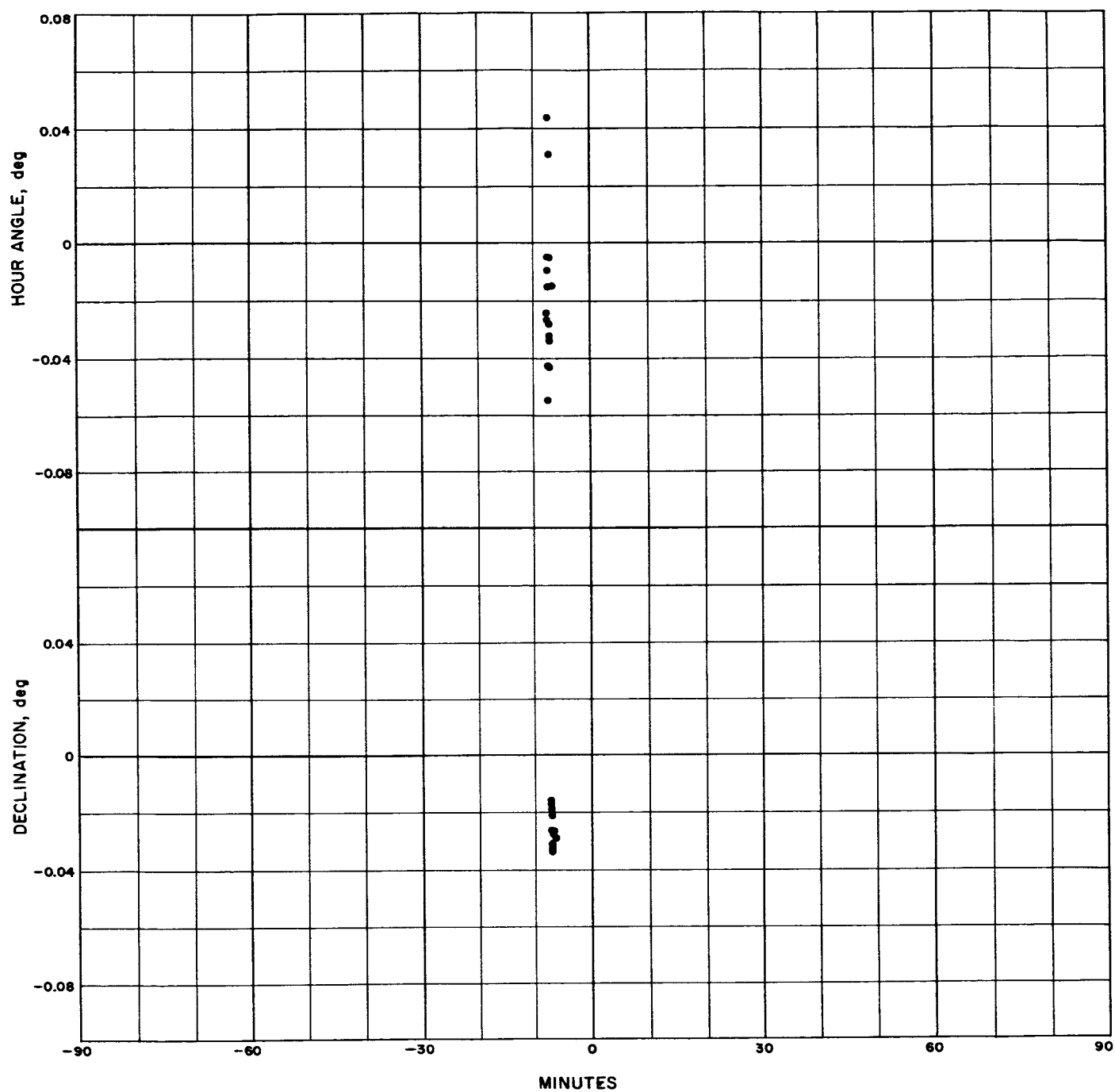


Fig. D-5. Station 41 pass No. 10/181 residuals (from 18:39:51 to 18:53:51 GMT)

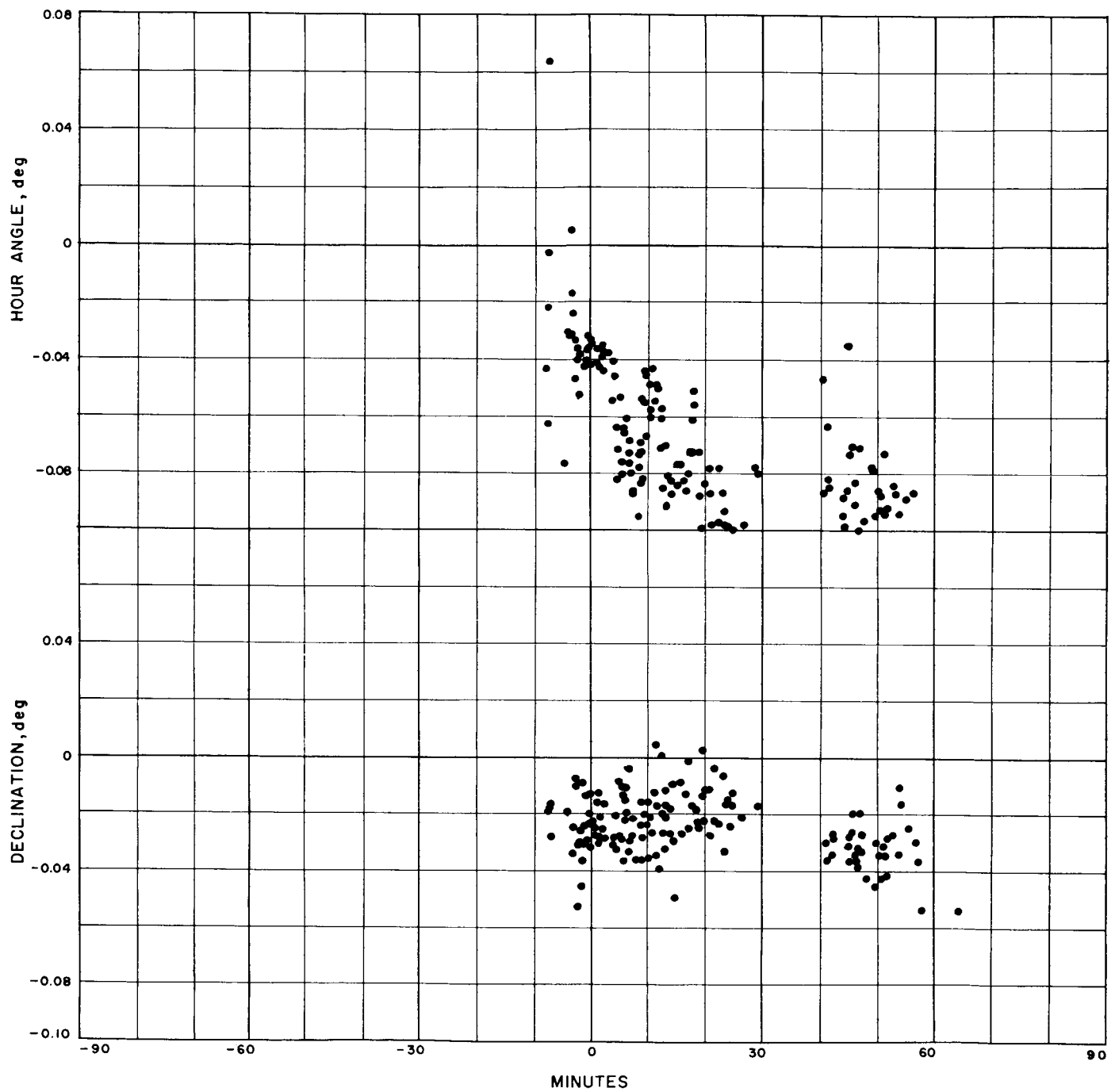


Fig. D-6. Station 41 pass No. 10/181 residuals (from 18:54:51 to 01:04:02 GMT)

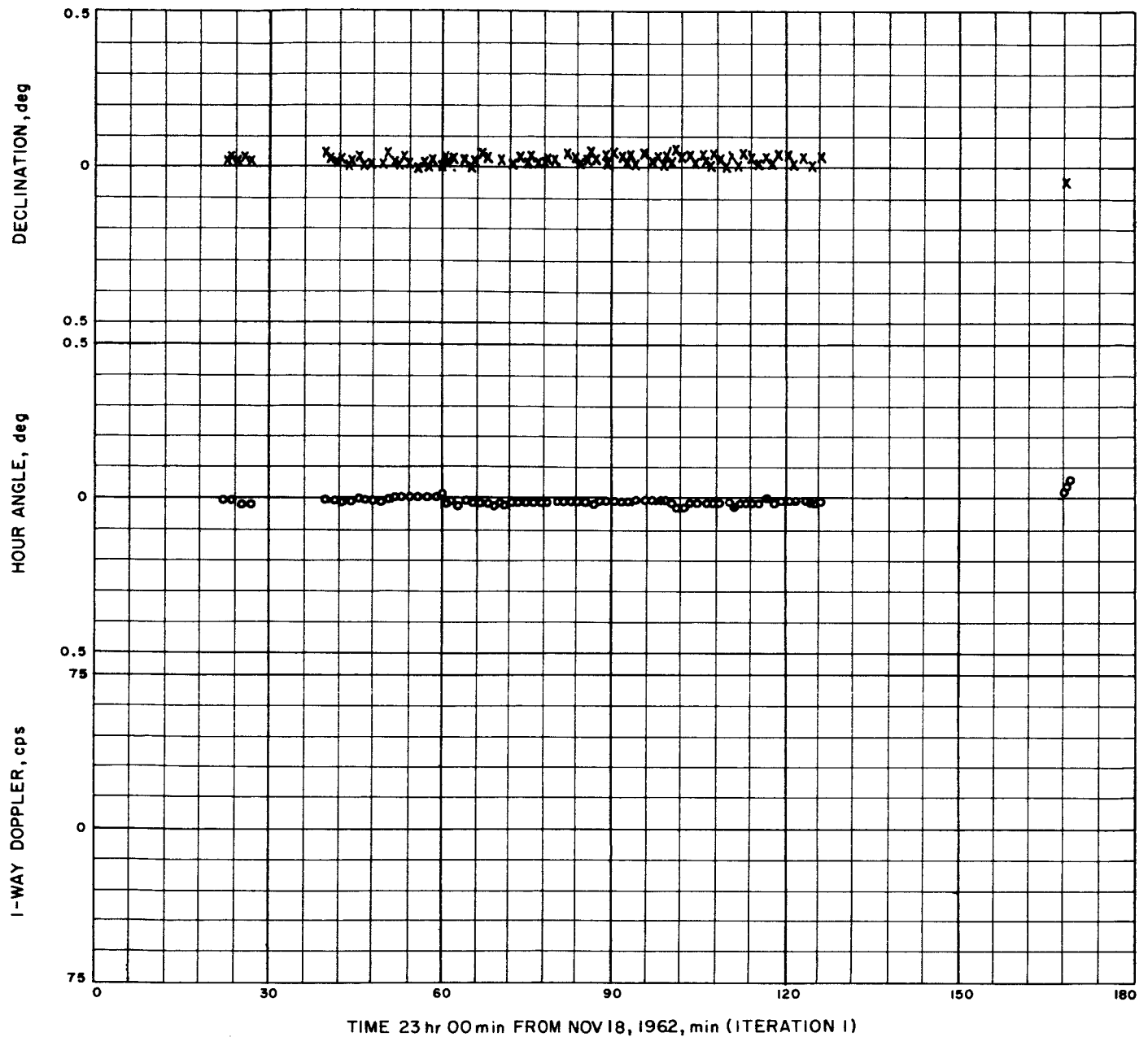


Fig. D-7. Station 51 pass No. 10/181 residuals (23:00 GMT)

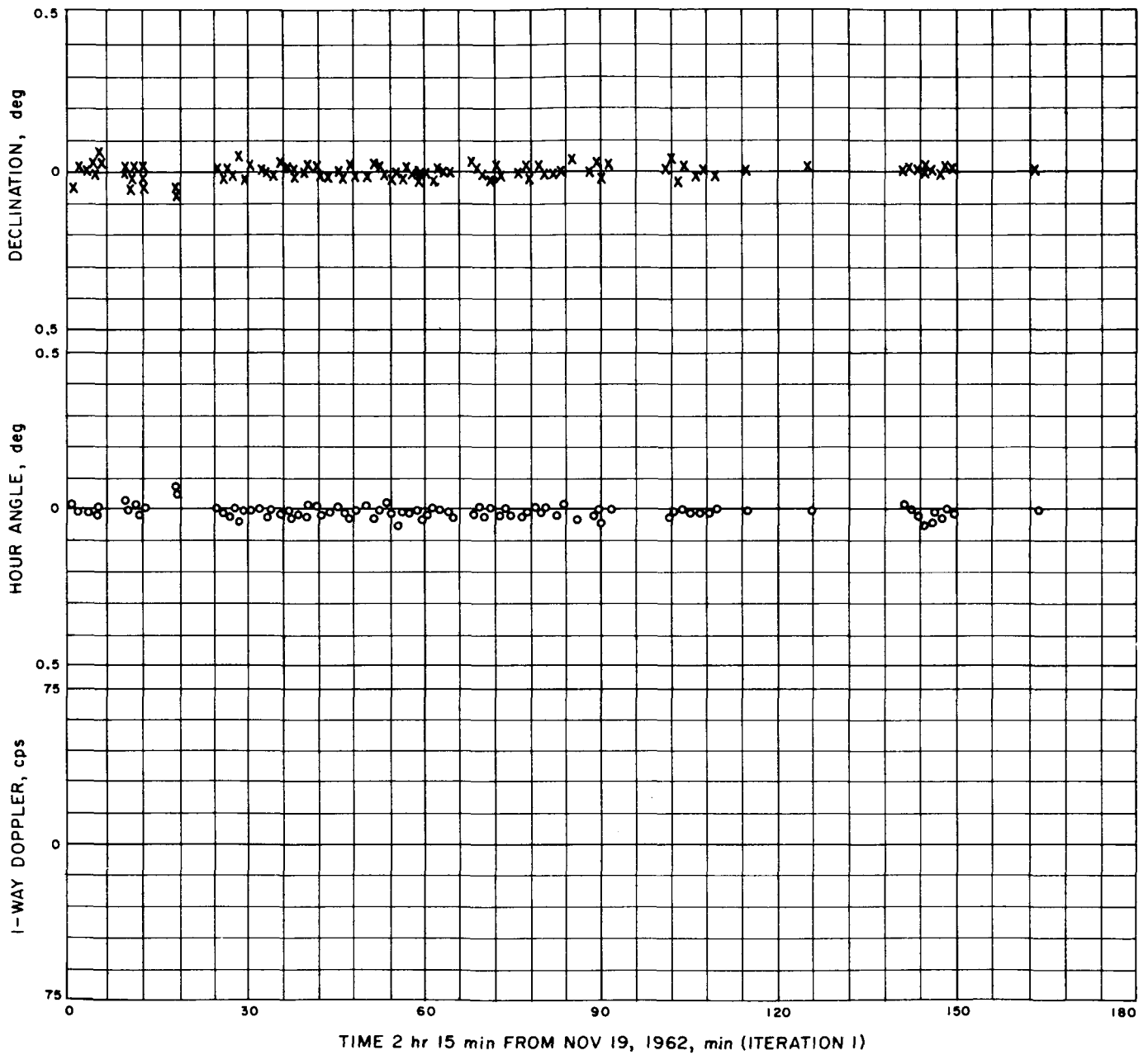


Fig. D-8. Station 51 pass No. 10/181 residuals (2:15 GMT)

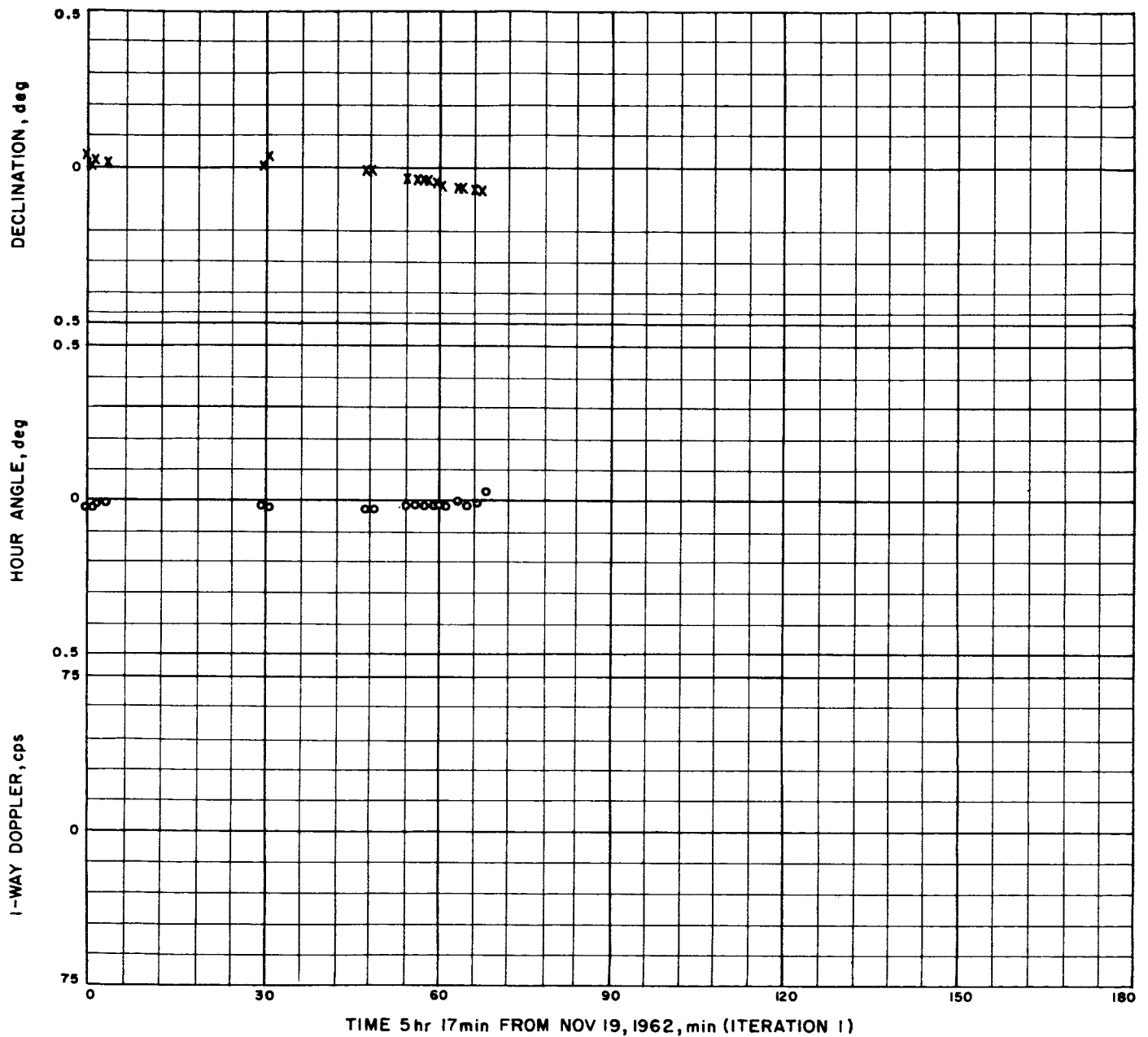


Fig. D-9. Station 51 pass No. 10/181 residuals (5:17 GMT)

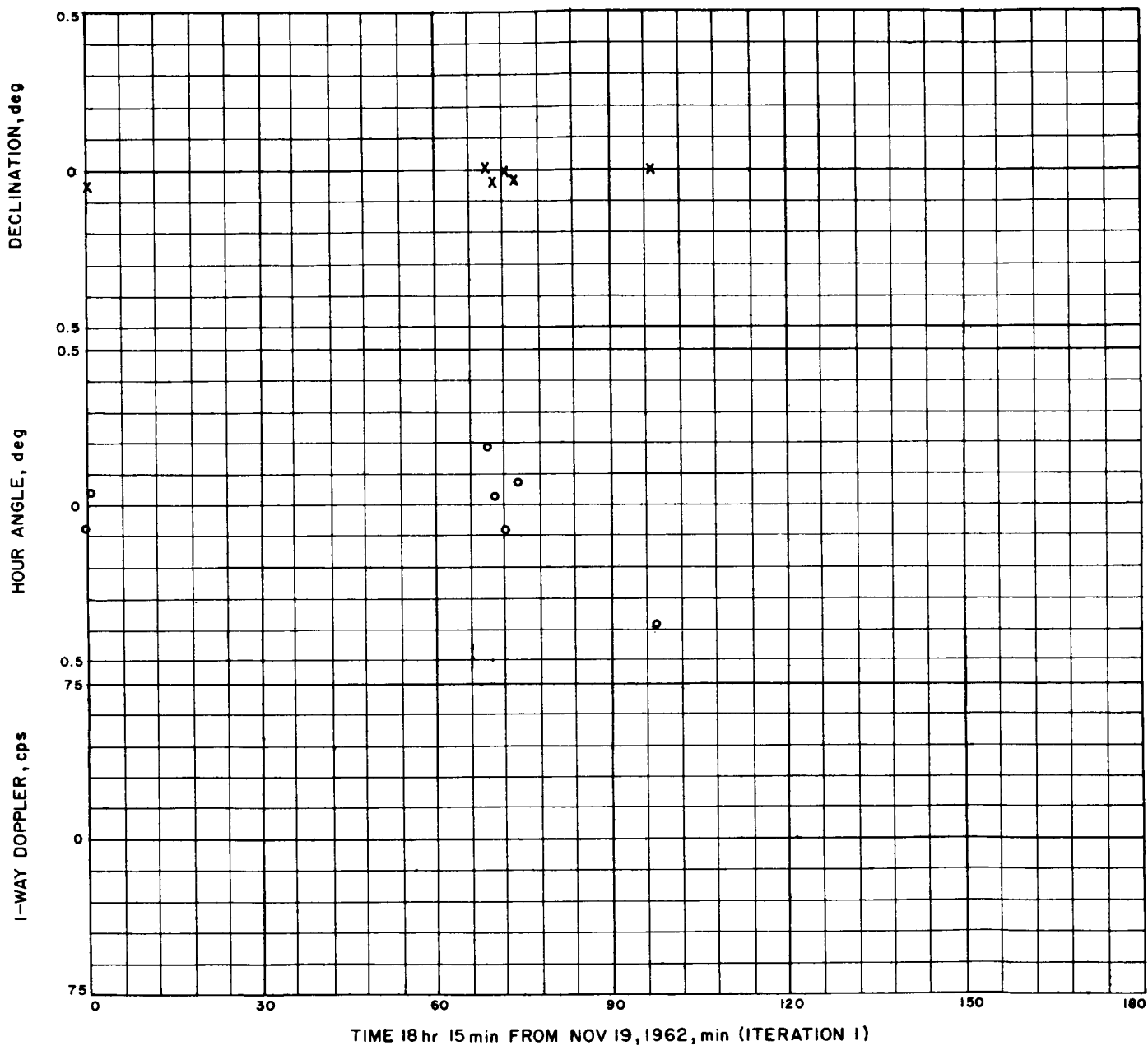


Fig. D-10. Station 41 pass No. 10/192 residuals (18:15 GMT)

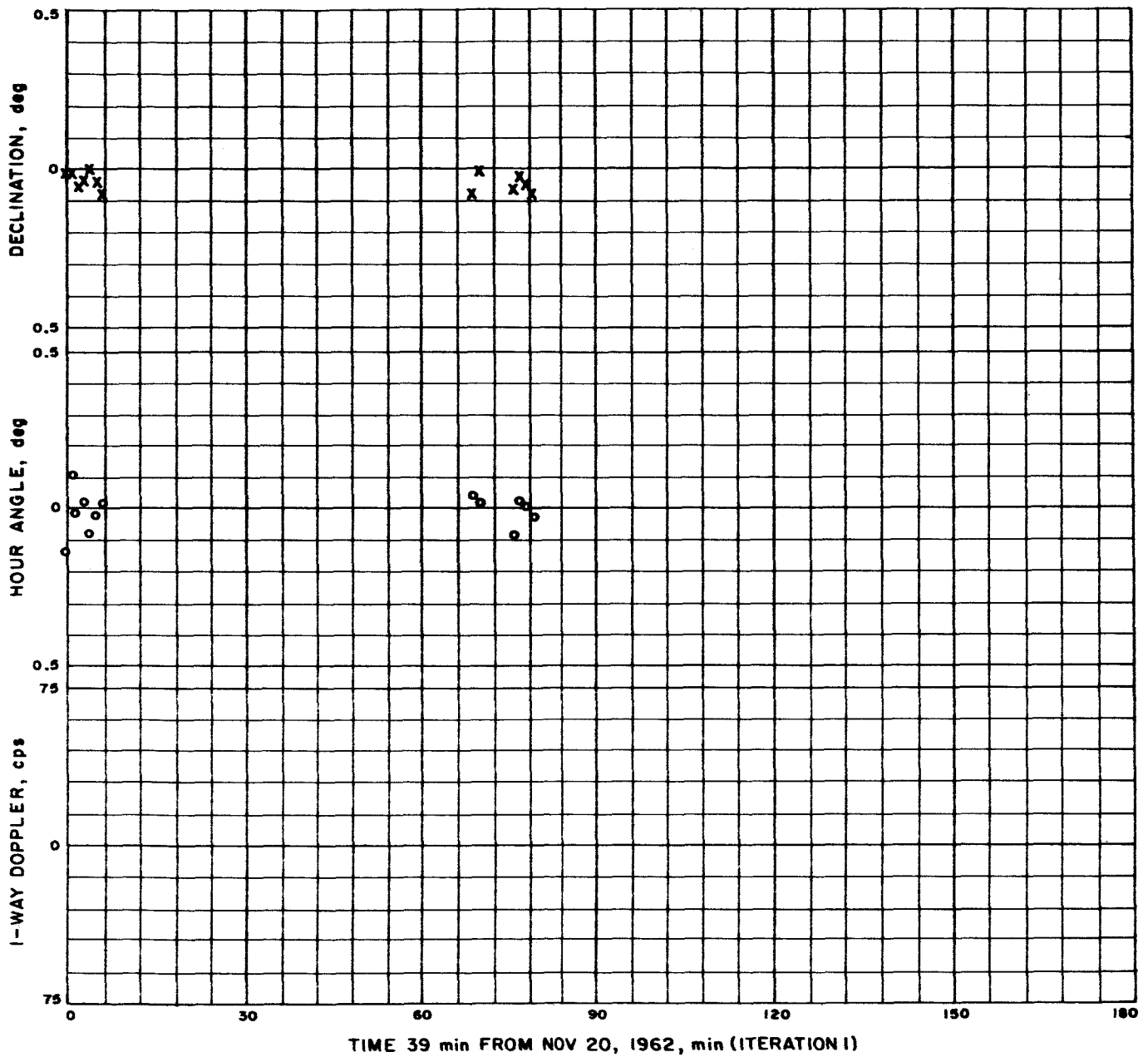


Fig. D-11. Station 41 pass No. 10/192 residuals (0:39 GMT)

APPENDIX E

Orbit Determination Program Printout

I. RANGER 5 PREMIDCOURSE ORBIT

CASE 1

SPACE TRAJECTORIES

1

EPHEMERIDES WITH VENUS VELOCITIES

GME .39860005 06 J .16234500-02 H -.57499999-05 D .78749999-05 RE .63781650 04 REM .63783149 04
 G .66709998-19 A .88745998 29 B .88745998 29 C .88800998 29 DME .41780741-02 AU .14959900 09
 GMM .49007604 04 GMS .13271544 12 GMV .32476950 06 GMA .42977799 05 GMC .00000000 00 GMJ .12671060 09

INJECTION CONDITIONS

MOON JULIAN DATE 2437956.23429397 OCT. 18, 1962 17 37 23.000

GEOCENTRIC XO .58072045 04 YO-.18712696 04 ZO-.28917849 04 DXO .36254793 01 DY0 .97466335 01 DZO-.28587352 01
 CARTESIAN GMC .00000000 00 SGC .00000000 00 TO .63443000 05 GHA .29107121 03 GHD .26001651 02

0 DAYS 0 HRS. 0 MIN. 0.000 SEC.

JULIAN DATE 2437956.23429397 OCT. 18, 1962 17 37 23.000

GEOCENTRIC

EQUATORIAL COORDINATES

X .58072042 04 Y -.18712695 04 Z -.28917848 04 DX .36254792 01 DY .97466330 01 DZ -.28587350 01
 R .67518656 04 DEC -.25359354 02 RA .34213937 03 V .10801135 02 PTH .87138015 01 AZ .10292466 03
 R .67518656 04 LAT -.25359354 02 LON .51068163 02 VE .10373187 02 PTE .90762677 01 AZE .10348129 03
 XS -.13520355 09 YS -.57485767 08 ZS -.24927463 08 DXS .12999476 02 DYS -.24699600 02 DZS -.10709378 02
 XM -.35387210 05 YM .35420188 06 ZM .13533405 06 DXM .10263041 01 DYM -.47486097-01 DZM .61074614-01
 XT -.35387210 05 YT .35420188 06 ZT .13533405 06 DXT -.10263041 01 DYT -.47486097-01 DZT .61074614-01
 RS .14901675 09 VS .29895608 02 RM .38082349 06 VM .10292157 01 RT .38082349 06 VT .10292157 01
 GED -.25510281 02 ALT .37762024 03 LOS .27146298 03 RAS .20303420 03 RAM .95705310 02 LOM .16463410 03
 DUT .34000000 02 DT .15000000 02 DR .16363602 01 SHA .53923425 04 DES -.96296871 01 DEM .20816252 02

GEOCENTRIC

EQUATORIAL COORDINATES

EPOCH OF PERICENTER PASSAGE JULIAN DATE 2437956.23211020 OCT. 18, 1962 17 34 14.322
 SMA .28338638 06 ECC .97672770 00 INC .28267556 02 LAN .10032216 03 APF .22709996 03 RCA .65950505 04
 VH .12868423 00 C3 -.14065603 01 C1 .72086038 05 SLR .13036619 05 APO .56017771 06 TFP .18867777 03
 TA .17636897 02 EA .19287510 01 MA .45242184-01 DAO .20299316 02 RAD .32378684 03 MTA .18000000 03
 WX .46592490 00 WY .84859047-01 WZ .88074566 00 PX .75671531 00 PY -.55409867 00 PZ -.34692447 00
 QX .45858032 00 QY .82811447 00 QZ .32238250 00 RX .75409175-01 RY .45422299 00 RZ .88777514 00
 SXD .75671531 00 SYD -.55409867 00 SZD -.34692447 00 TX -.64949612 00 TY -.69760743 00 TZ -.30248748 00
 BX -.45858033 00 BY -.82811449 00 BZ .32238251 00 MX .20775271 00 MY .95707242 00 MZ -.20211671 00
 B.T .47287994 05 B.R -.38184770 05 B .60781588 05 PER .25022369 05 QMD .11568786-01 NOD -.70793328-02
 C3J -.17673254 01

HELIOCENTRIC

ECLIPTIC COORDINATES

X .13520936 09 Y .62654867 08 Z -.16777500 04 DX -.93739973 01 DY .34742733 02 DZ -.65083368 01
 R .14902082 09 LAT -.64506418-03 LON .24862606 02 V .36568945 02 PTH .96058455 01 AZ .10039908 03
 XE .13520355 09 YE .62657735 08 ZE .23125000 03 DXE -.12999476 02 DYE .26921386 02 DZE -.88334083-03
 XT .13516816 09 YT .63036539 08 ZT -.16518250 05 DXT -.14025781 02 DYT .26902116 02 DZT .74041723-01
 LTE .88913819-04 LOE .24864544 02 LTT -.63457043-02 LOT .25002294 02 RST .14914435 09 VST .30338950 02
 EPS .52998810 02 ESP .98911702-02 SEP .12699911 03 EPM .59788097 02 EMP .87787433 00 MEP .11933401 03
 MPS .10868800 03 MSP .13970734 00 SMP .71172195 02 SEM .10950792 03 EMS .70354181 02 ESM .13776809 00
 EPT .59788097 02 ETP .87787433 00 TEP .11933401 03 TPS .10868800 03 TSP .13970734 00 STP .71172195 02
 SET .10950792 03 STE .70354181 02 EST .13776809 00 RPM .38417632 06 RPT .38417632 06 SPN -.17845042 02
 GCE .26321723 03 GCT .28628363 03 SIP .10842879 03 CPT .73767244 02 SIN .73508038 02 D1 .13572032 00
 REP .67518656 04 VEP .10801135 02 CPE .96943128 02 CPS .92538460 02 D2 .43988254-01 D3 .20935527-03

0 DAYS 0 HRS. 10 MIN. 0.000 SEC.

JULIAN DATE 2437956.24123842

OCT. 18, 1962 17 47 23.000

CASE 1

2

44

SPACE TRAJECTORIES

RA-5 PREMIORCOURSE ORBIT

GEOCENTRIC

EQUATORIAL COORDINATES

X	.67941044	04	Y	.40122196	04	Z	-.39791851	04	DX	.54344019	-01	DY	.93768808	01	DZ	-.92790306	00
R	.88369493	04	DEC	-.26762257	02	RA	.30563730	02	V	.94228366	01	PTH	.30038984	02	AZ	.80547961	02
R	.88369492	04	LAT	-.26762258	02	LON	.96985676	02	VE	.89356234	01	PTE	.31858986	02	AZE	.79834681	02
XS	-.13519575	09	YS	-.57500585	08	ZS	-.24933889	08	DXS	.13002732	02	DYS	-.24698235	02	DZS	-.10708785	02
XM	-.36002943	05	YM	.35417292	06	ZM	.13537052	06	DXM	-.10261384	01	DYM	-.49043410	-01	DZM	.60479669	-01
XT	-.36002943	05	YT	.35417292	06	ZT	.13537052	06	DXT	-.10261384	01	DYT	-.49043410	-01	DZT	.60479669	-01
RS	.14901647	09	VS	.29895684	02	RM	.38086722	06	VM	.10290885	01	RT	.38086722	06	VT	.10290885	01
GED	-.26919026	02	ALT	.24631213	04	LDS	.26946264	03	RAS	.20304070	03	RAM	.95804380	02	LOM	.16222632	03
DUT	.34000000	02	DT	.59999999	02	DR	.47169646	01	SHA	.53329729	04	DES	-.96322126	01	DEM	.20819619	02

HELIOCENTRIC

ECLIPTIC COORDINATES

X	.13520255	09	Y	.62675984	08	Z	-.50160000	04	DX	-.12948388	02	DY	.35153645	02	DZ	-.45826195	01
R	.14902352	09	LAT	-.19285253	-02	LON	.24871073	02	V	.37741752	02	PTH	.46162055	01	AZ	.96996738	02
XE	.13519575	09	YE	.62673886	08	ZE	.23100000	03	DXE	-.13002732	02	DYE	.26919898	02	DZE	-.88405608	-03
XT	.13519575	09	YT	.63052680	08	ZT	-.16473500	05	DXT	-.14028870	02	DYT	.26898963	02	DZT	.74114441	-01
LTE	.88817866	-04	LOE	.24871439	02	LTT	-.63285471	-02	LDT	.25009280	02	RST	.14914355	09	VST	.30337582	02
EPS	.37117903	02	ESP	.27453512	-18	SEP	.14288004	03	EPH	.99811839	02	EMP	.13108232	01	MEP	.79077321	02
MPS	.10838076	03	MSP	.13829968	00	SMP	.71480963	02	SEM	.10942253	03	EMS	.70439477	02	ESM	.13776809	00
EPT	.99611839	02	ETP	.13108232	01	TEP	.79077321	02	TPS	.10838076	03	TSP	.13829968	00	STP	.71480963	02
SET	.10942253	03	STE	.70439477	02	EST	.13776809	00	RPM	.37929202	06	RPT	.37929202	06	SPN	-.90806103	01
GCE	.20425205	03	GCT	.28576981	03	SIP	.10811821	03	CPT	.74238230	02	SIN	.73975686	02	D1	.13746808	00
REP	.88369493	04	VEP	.94228366	01	CPE	.12580451	03	CPS	.92541746	02	D2	.43852657	-01	D3	.21099964	-03

0 DAYS 0 HRS. 20 MIN. 0.000 SEC.

JULIAN DATE 2437956.24818286

OCT. 18, 1962 17 57 23.000

GEOCENTRIC

EQUATORIAL COORDINATES

X	.63034878	04	Y	.92056969	04	Z	-.42171780	04	DX	-.14482836	01	DY	.79570248	01	DZ	.44149064	-02
R	.11927422	05	DEC	-.20705824	02	RA	.55599086	02	V	.80877554	01	PTH	.41644290	02	AZ	.70312225	02
R	.11927422	05	LAT	-.20705825	02	LON	.11951418	03	VE	.75375228	01	PTE	.45480533	02	AZE	.67339381	02
XS	-.13518795	09	YS	-.57515404	08	ZS	-.24940314	08	DXS	.13005987	02	DYS	-.24696871	02	DZS	-.10708192	02
XM	-.36618576	05	YM	.35414303	06	ZM	.13540663	06	DXM	-.10259702	01	DYM	-.50600073	-01	DZM	.59884761	-01
XT	-.36618576	05	YT	.35414303	06	ZT	.13540663	06	DXT	-.10259702	01	DYT	-.50600073	-01	DZT	.59884761	-01
RS	.14901618	09	VS	.29895760	02	RM	.38091096	06	VM	.10289613	01	RT	.38091096	06	VT	.10289613	01
GED	-.20834852	02	ALT	.55519149	04	LDS	.26696231	03	RAS	.20304721	03	RAM	.95903432	02	LOM	.15981853	03
DUT	.34000000	02	DT	.12000000	03	DR	.53743464	01	SHA	.82999985	04	DES	-.96334736	01	DEM	.20822929	02

HELIOCENTRIC

ECLIPTIC COORDINATES

X	.13519425	09	Y	.62696806	08	Z	-.73010000	04	DX	-.14454271	02	DY	.34220404	02	DZ	-.31623937	01
R	.14902475	09	LAT	-.28070268	-02	LON	.24879677	02	V	.37282204	02	PTH	.19741825	01	AZ	.94868652	02
XE	.13518795	09	YE	.62690039	08	ZE	.23050000	03	DXE	-.13005987	02	DYE	.26918410	02	DZE	-.88536739	-03
XT	.13518795	09	YT	.63068819	08	ZT	-.16429250	05	DXT	-.14031957	02	DYT	.26895810	02	DZT	.74186801	-01
LTE	.88625788	-04	LOE	.24878336	02	LTT	-.63115819	-02	LDT	.25016266	02	RST	.14914274	09	VST	.30336215	02
EPS	.44093813	02	ESP	.27453512	-18	SEP	.13590299	03	EPH	.12122267	03	EMP	.15344371	01	MEP	.57242905	02
MPS	.10829255	03	MSP	.13651968	00	SMP	.71570814	02	SEM	.10933717	03	EMS	.70524751	02	ESM	.13812271	00
EPT	.12122267	03	ETP	.15344371	01	TEP	.57242905	02	TPS	.10829255	03	TSP	.13651968	00	STP	.71570814	02
SET	.10933717	03	STE	.70524751	02	EST	.13812271	00	RPM	.37459160	06	RPT	.37459160	06	SPN	.11767929	02
GCE	.16909444	03	GCT	.28541568	03	SIP	.10802671	03	CPT	.74569248	02	SIN	.74303409	02	D1	.13919309	00
REP	.11927422	05	VEP	.80877554	01	CPE	.13560075	03	CPS	.92544673	02	D2	.44197509	-01	D3	.21520243	-03

0 DAYS 0 HRS. 40 MIN. 0.000 SEC.

JULIAN DATE 2437956.26207176

OCT. 18, 1962 18 17 23.000

CASE 1

SPACE TRAJECTORIES

3

RA-5 PREMIDCOURSE ORBIT

GEOCENTRIC

EQUATORIAL COORDINATES

X	-39342783	04	Y	.17483859	05	Z	-.37558585	04	DX	-.22706322	01	DY	-.60468681	01	DZ	-.62289629	00
R	.18310388	05	DEC	-.11836625	02	RA	.77318336	02	V	.64890973	01	PTH	.52646949	02	AZ	.64136273	02
R	.18310388	05	LAT	-.11836625	02	LON	.13621975	03	VE	.58784962	01	PTE	.61339827	02	AZE	.52470751	02
XS	-.13517234	09	YS	-.57545041	08	ZS	-.24953163	08	DXS	.13012497	02	DYS	-.24694140	02	DZS	-.10707006	02
XM	-.37849539	05	YM	.35408044	06	ZM	.13547778	06	DXM	-.10256258	01	DYM	-.53711440	-01	DZM	.58695064	-01
XT	-.37849539	05	YT	.35408044	06	ZT	.13547778	06	DXT	-.10256258	01	DYT	-.53711440	-01	DZT	.58695064	-01
RS	.14901561	09	VS	.29895912	02	RM	.38099839	06	VM	.10287071	01	RT	.38099839	06	VT	.10287071	01
GED	-.11914991	02	ALT	.11933090	05	LOS	.26196164	03	RAS	.20306023	03	RAM	.96101479	02	LOM	.15500289	03
DUT	-.34000000	02	DT	.12000000	03	DR	.51582617	01	SHA	.15535248	05	DES	-.96397848	01	DEM	.20829375	02

HELIOCENTRIC

ECLIPTIC COORDINATES

X	.13517627	09	Y	.62736886	08	Z	-.10172250	05	DX	-.15283130	02	DY	-.32710989	02	DZ	-.18350434	01
R	.14902530	09	LAT	-.39109262	-02	LON	.24896565	02	V	.36151767	02	PTH	-.14582881	00	AZ	.92909572	02
XE	.13517234	09	YE	.62722340	08	ZE	.22925000	03	DXE	-.13012497	02	DYE	.26915432	02	DZE	-.88715553	-03
XT	.13513449	09	YT	.63101090	08	ZT	-.16339750	05	DXT	-.14038123	02	DYT	.26889504	02	DZT	.74331283	-01
LTE	.88145509	-04	LOE	.24892129	02	LTT	-.62772667	-02	LOT	.25030237	02	RST	.14914113	09	VST	.30333478	02
EPS	.58036312	02	ESP	.27453512	-18	SEP	.12195771	03	EPM	.14073445	03	EMP	.17430615	01	MEP	.37522495	02
MPS	.10834923	03	MSP	.13362238	00	SMP	.71517070	02	SEM	.10916650	03	EMS	.70695239	02	ESM	.13812271	00
EPT	.14073445	03	ETP	.17430615	02	TEP	.37522495	02	TPS	.10834923	03	TSP	.13362238	00	STP	.71517070	02
SET	.10916650	03	STE	.70695239	02	EST	.13812271	00	RPM	.36664581	06	RPT	.36664581	06	SPN	.37651302	02
GCE	.14597694	03	GCT	.28495947	03	SIP	.10807763	03	CPT	.75002703	02	SIN	.74731103	02	D1	.14220968	00
REP	.18310388	05	VEP	.64890973	01	CPE	.13655260	03	CPS	.92549813	02	D2	.45286705	-01	D3	.22533403	-03

0 DAYS 1 HRS. 10 MIN. 0.000 SEC.

JULIAN DATE 2437956.28290509

OCT. 18, 1962 18 47 23.000

GEOCENTRIC

EQUATORIAL COORDINATES

X	-.34975021	03	Y	.26943470	05	Z	-.23939768	04	DX	-.24165863	01	DY	-.46368705	01	DZ	.83518024	00
R	.27051876	05	DEC	-.50770759	01	RA	.90743706	02	V	.52950905	01	PTH	.59782995	02	AZ	.62148529	02
R	.27051876	05	LAT	-.50770759	01	LON	.14212458	03	VE	.47580899	01	PTE	.74081145	02	AZE	.17447221	02
XS	-.13514891	09	YS	-.57589489	08	ZS	-.24972436	08	DXS	.13022262	02	DYS	-.24690039	02	DZS	-.10705225	02
XM	-.39695194	05	YM	.35397957	06	ZM	.13558182	06	DXM	-.10250896	01	DYM	-.58373524	-01	DZM	.56910842	-01
XT	-.39695194	05	YT	.35397957	06	ZT	.13558182	06	DXT	-.10250896	01	DYT	-.58373524	-01	DZT	.56910842	-01
RS	.14901476	09	VS	.29896140	02	RM	.38112946	06	VM	.10283263	01	RT	.38112946	06	VT	.10283263	01
GED	-.51114924	01	ALT	.20673839	05	LOS	.25446064	03	RAS	.20307976	03	RAM	.96398405	02	LOM	.14777928	03
DUT	-.34000000	02	DT	.24000000	03	DR	.45756227	01	SHA	.25255150	05	DES	-.96473569	01	DEM	.20838614	02

HELIOCENTRIC

ECLIPTIC COORDINATES

X	.13514856	09	Y	.62794554	08	Z	-.12687500	05	DX	-.15438848	02	DY	-.31497359	02	DZ	-.10793421	01
R	.14902446	09	LAT	-.48779925	-02	LON	.24921162	02	V	.35094253	02	PTH	-.11905216	01	AZ	.91762923	02
XE	.13514891	09	YE	.62770787	08	ZE	.22775000	03	DXE	-.13022262	02	DYE	.26910962	02	DZE	-.88977813	-03
XT	.13510921	09	YT	.63149488	08	ZT	-.16205000	05	DXT	-.14047352	02	DYT	.26880047	02	DZT	.74546336	-01
LTE	.87569266	-04	LOE	.24912817	02	LTT	-.62259845	-02	LOT	.25051192	02	RST	.14913872	09	VST	.30329368	02
EPS	.68990573	02	ESP	.13988227	-01	SEP	.11099972	03	EPM	.15155948	03	EMP	.19371461	01	MEP	.26503374	02
MPS	.10859468	03	MSP	.13009806	00	SMP	.71275275	02	SEM	.10891067	03	EMS	.70950808	02	ESM	.13865293	00
EPT	.15155948	03	ETP	.19371461	01	TEP	.26503374	02	TPS	.10859468	03	TSP	.13009806	00	STP	.71275275	02
SET	.10891067	03	STE	.70950808	02	EST	.13865293	00	RPM	.35712461	06	RPT	.35712461	06	SPN	.55353603	02
GCE	.13470099	03	GCT	.28453812	03	SIP	.10831584	03	CPT	.75409591	02	SIN	.75130751	02	D1	.14600119	00
REP	.27051876	05	VEP	.52950905	01	CPE	.13222043	03	CPS	.92556679	02	D2	.47066019	-01	D3	.24084798	-03

0 DAYS 1 HRS. 30 MIN. 0.000 SEC.

JULIAN DATE 2437956.29679397

OCT. 18, 1962 19 07 23.000

CASE 1

SPACE TRAJECTORIES

4

RA-5 PREMIDCOURSE ORBIT

GEOCENTRIC

EQUATORIAL COORDINATES

X	-32347965	04	Y	32162287	05	Z	-13665520	04	DX	-23857680	01	DY	40937055	01	DZ	87087224	00
R	32353424	05	DEC	-24207923	01	RA	95747330	02	V	48175441	01	PTH	62450051	02	AZ	61821122	02
R	32353424	05	LAT	-24207923	01	LON	14211052	03	VE	44164927	01	PTE	75266389	02	AZE	33951868	03
XS	-13513328	09	YS	-57619115	08	ZS	-24985281	08	DXS	13028771	02	DYS	-24687304	02	DZS	-10704037	02
XM	-40925081	05	YM	35390766	06	ZM	13564940	06	DXM	-10247191	01	DYM	-61478211	01	DZM	55721606	01
XT	-40925081	05	YT	35390766	06	ZT	13564940	06	DXT	-10247191	01	DYT	-61478211	01	DZT	55721606	01
RS	14901419	09	VS	29896292	02	RM	38121679	06	VM	10280728	01	RT	38121679	06	VT	10280728	01
GED	-24372697	01	ALT	25975256	05	LOS	24945997	03	RAS	20309278	03	RAM	96596256	02	LOM	14296344	03
DUT	34000000	02	DT	24000000	03	DR	42712730	01	SHA	30995893	05	DES	-96524044	01	DEM	20844487	02

HELIOCENTRIC

ECLIPTIC COORDINATES

X	13513004	09	Y	62832042	08	Z	-13822500	05	DX	-15414539	02	DY	31010244	02	DZ	-83050966	00
R	14902347	09	LAT	-53144038	02	LON	24937233	02	V	34640049	02	PTH	-14932117	01	AZ	91374427	02
XE	13513328	09	YE	62803078	08	ZE	22650000	03	DXE	-13028771	02	DYE	26907980	02	DZE	-89156627	03
XT	13509235	09	YT	63181739	08	ZT	-16116500	05	DXT	-14053490	02	DYT	26873744	02	DZT	74688553	01
LTE	87088978	04	LOE	24926611	02	LTT	-61916678	02	LOT	25065161	02	RST	14913710	09	VST	30326626	02
EPS	73331618	02	ESP	13988227	01	SEP	10665646	03	EPM	15463629	03	EMP	20833981	01	MEP	23280281	02
MPS	10878527	03	MSP	12782211	00	SMP	71086792	02	SEM	10874023	03	EMS	71112107	02	ESM	13865293	00
EPT	15463629	03	ETP	20833981	01	TEP	23280281	02	TPS	10878527	03	TSP	12782211	00	STP	71086792	02
SET	10874023	03	STE	71112107	02	EST	13865293	00	RPM	35173002	06	RPT	35173002	06	SPN	61962132	02
GCE	13089602	03	GCT	28433643	03	SIP	10850216	03	CPT	75606513	02	SIN	75323395	02	D1	14824051	00
REP	32353424	05	VEP	48175441	01	CPE	12974477	03	CPS	92560976	02	D2	48275089	01	D3	25098231	03

0 DAYS 3 HRS. 0 MIN. 0.000 SEC.

JULIAN DATE 2437956.35929397

OCT. 18, 1962

20 37 23.000

GEOCENTRIC

EQUATORIAL COORDINATES

X	-15458624	05	Y	50451653	05	Z	33526115	04	DX	-21422580	01	DY	28845730	01	DZ	85775936	00
R	52873228	05	DEC	36354774	01	RA	10703531	03	V	36940197	01	PTH	68339917	02	AZ	61940436	02
R	52873228	05	LAT	36354774	01	LON	13084089	03	VE	43808802	01	PTE	51598263	02	AZE	28363184	03
XS	-13506284	09	YS	-57752403	08	ZS	-25043072	08	DXS	13058055	02	DYS	-24674976	02	DZS	-10698683	02
XM	-46453837	05	YM	35353801	06	ZM	13593585	06	DXM	-10229231	01	DYM	-75415304	01	DZM	50372698	01
XT	-46453837	05	YT	35353801	06	ZT	13593585	06	DXT	-10229231	01	DYT	-75415304	01	DZT	50372698	01
RS	14901163	09	VS	29896975	02	RM	38160927	06	VM	10269355	01	RT	38160927	06	VT	10269355	01
GED	36601853	01	ALT	46495109	05	LOS	22695696	03	RAS	20315138	03	RAM	97485611	02	LOM	12129119	03
DUT	34000000	02	DT	48000000	03	DR	34333184	01	SHA	52519540	05	DES	-96751130	01	DEM	20868073	02

HELIOCENTRIC

ECLIPTIC COORDINATES

X	13504738	09	Y	62995975	08	Z	-16774250	05	DX	-15200313	02	DY	29882259	02	DZ	-36151600	00
R	14901774	09	LAT	-64495253	02	LON	25007788	02	V	33528042	02	PTH	-19532625	01	AZ	90618380	02
XE	13506284	09	YE	62948355	08	ZE	22125000	03	DXE	-13058055	02	DYE	26894540	02	DZE	-89907645	03
XT	13501638	09	YT	63326791	08	ZT	-15712000	05	DXT	-14080978	02	DYT	26845389	02	DZT	75318336	01
LTE	85071821	04	LOE	24988681	02	LTT	-60365606	02	LOT	25128006	02	RST	14912983	09	VST	30314263	02
EPS	83348911	02	ESP	20982341	01	SEP	96630894	02	EPM	15736557	03	EMP	30565740	01	MEP	19577839	02
MPS	10965504	03	MSP	12033130	00	SMP	70224735	02	SEM	10797428	03	EMS	71886258	02	ESM	13918114	00
EPT	15736557	03	ETP	30565740	01	TEP	19577839	02	TPS	10965504	03	TSP	12033130	00	STP	70224735	02
SET	10797428	03	STE	71886258	02	EST	13918114	00	RPM	33226549	06	RPT	33226549	06	SPN	76420553	02
GCE	12282131	03	GCT	28374364	03	SIP	10935534	03	CPT	76193453	02	SIN	75893750	02	D1	15692485	00
REP	52873228	05	VEP	36940197	01	CPE	12289079	03	CPS	92579076	02	D2	53354553	01	D3	29512287	03

0 DAYS 5 HRS. 0 MIN. 0.000 SEC.

JULIAN DATE 2437956.44262731

OCT. 18, 1962

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CASE 1

SPACE TRAJECTORIES

5

RA-5 PREMIDCOURSE ORBIT

GEOCENTRIC

X	-29937079	05	Y	.68526171	05	Z	.92859943	04	DX	-18961275	01	DY	.22195830	01	DZ	.79120096	00
R	.75354458	05	DEC	.70786031	01	RA	.11359911	03	V	.30245408	01	PTH	.71560451	02	AZ	.62551400	02
R	.75354458	05	LAT	.70786031	01	LON	.10732255	03	VE	.54428481	01	PTE	.31813802	02	AZE	.27547114	03
XS	-.13496867	09	YS	-.57930014	08	ZS	-.25120081	08	DXS	.13097084	02	DYS	-.24658494	02	DZS	-.10691524	02
XM	-.53809346	05	YM	.35292838	06	ZM	.13627288	06	DXM	-.10202031	01	DYM	-.93907969	-01	DZM	.43249133	-01
XT	-.53809346	05	YT	.35292838	06	ZT	.13627288	06	DXT	-.10202031	01	DYT	-.93907969	-01	DZT	.43249133	-01
RS	.14900821	09	VS	.29897886	02	RM	.38213110	06	VM	.10254285	01	RT	.38213110	06	VT	.10254285	01
GED	.71263479	01	ALT	.68976580	05	LOS	.19695297	03	RAS	.20322953	03	RAM	.98668862	02	LOM	.92392306	02
DUT	.34000000	02	DT	.48000000	03	DR	.28692546	01	SHA	.75346574	05	DES	-.97053760	01	DEM	.20892327	02

EQUATORIAL COORDINATES

HELIOCENTRIC

X	.134933873	09	Y	.63208507	08	Z	-.18527750	05	DX	-.14993321	02	DY	.29227709	02	DZ	-.15803671	00
R	.14900932	09	LAT	-.71241304	-02	LON	.25099508	02	V	.32849357	02	PTH	-.20573204	01	AZ	.90276080	02
XE	.13496867	09	YE	.63141943	08	ZE	.21450000	03	DXE	-.13097084	02	DYE	.26876569	02	DZE	-.90944766	-03
XT	.13491486	09	YT	.63519953	08	ZT	-.15166750	05	DXT	-.14117287	02	DYT	.26807618	02	DZT	.76129436	-01
LTE	.82478300	-04	LOE	.25071446	02	LTT	-.58274553	-02	LOT	.25211764	02	RST	.14912010	09	VST	.30297722	02
EPS	.89142215	02	ESP	.27088086	-01	SEP	.90828811	02	EPH	.15528486	03	EMP	.47293219	01	MEP	.19985799	02
MPS	.11071504	03	MSP	.11234211	00	SMP	.69172694	02	SEM	.10695572	03	EMS	.72903836	02	ESM	.14040588	00
EPT	.15528486	03	ETP	.47293219	01	TEP	.19985799	02	TSP	.11071504	03	TSP	.11234211	00	STP	.69172694	02
SET	.10695572	03	STE	.72903836	02	EST	.14040588	00	RPM	.31237824	06	RPT	.31237824	06	SPN	.84286892	02
GCE	.11833992	03	GCT	.28327467	03	SIP	.11039625	03	CPT	.76666983	02	SIN	.76348200	02	D1	.16691562	00
REP	.75354458	05	VEP	.30245408	01	CPE	.11834885	03	CPS	.92601822	02	D2	.59656564	-01	D3	.35328436	-03

ECLIPTIC COORDINATES

0 DAYS 7 HRS. 0 MIN. 0.000 SEC.

JULIAN DATE 2437956.52596065

OCT. 19, 1962 00 37 23.000

GEOCENTRIC

X	-.42942844	05	Y	.83114129	05	Z	.14774162	05	DX	-.17258067	01	DY	.18619557	01	DZ	.73536865	00
R	.94711784	05	DEC	.89742622	01	RA	.11732419	03	V	.26431146	01	PTH	.73263950	02	AZ	.63066638	02
R	.94711782	05	LAT	.89742622	01	LON	.80965450	02	VE	.66533265	01	PTE	.22360610	02	AZE	.27321193	03
XS	-.13487423	09	YS	-.58107506	08	ZS	-.25197039	08	DXS	.13136091	02	DYS	-.24641956	02	DZS	-.10684343	02
XM	-.61143943	05	YM	.35218598	06	ZM	.13655866	06	DXM	-.10171153	01	DYM	-.11229190	00	DZM	.36137603	-01
XT	-.61143943	05	YT	.35218598	06	ZT	.13655866	06	DXT	-.10171153	01	DYT	-.11229190	00	DZT	.36137603	-01
RS	.14900480	09	VS	.29898797	02	RM	.38265103	06	VM	.10239331	01	RT	.38265103	06	VT	.10239331	01
GED	.90344145	01	ALT	.88334102	05	LOS	.16694896	03	RAS	.20330770	03	RAM	.99849102	02	LOM	.63490368	02
DUT	.34000000	02	DT	.95999999	03	DR	.25311562	01	SHA	-.94628960	05	DES	-.97356234	01	DEM	.20908413	02

EQUATORIAL COORDINATES

HELIOCENTRIC

X	.13483129	09	Y	.63417532	08	Z	-.19302250	05	DX	-.14861898	02	DY	.28859360	02	DZ	-.66994428	-01
R	.14900807	09	LAT	-.74223556	-02	LON	.25189821	-02	V	.32461410	02	PTH	-.20575705	01	AZ	.90118590	02
XE	.13487423	09	YE	.63335400	08	ZE	.20875000	03	DXE	-.13136091	02	DYE	.26858540	02	DZE	-.91898440	-03
XT	.13481309	09	YT	.63712842	08	ZT	-.14615250	05	DXT	-.14153206	02	DYT	.26769893	02	DZT	.76909065	-01
LTE	.80269181	-04	LOE	.25154214	02	LTT	-.56159224	-02	LOT	.25295480	02	RST	.14911034	09	VST	.30281122	02
EPS	.92359922	02	ESP	.37009371	-01	SEP	.87603688	02	EPH	.15287909	03	EMP	.64787349	01	MEP	.20642167	02
MPS	.11165996	03	MSP	.10584016	00	SMP	.68234360	02	SEM	.10594022	03	EMS	.73918396	02	ESM	.14144723	00
EPT	.15287909	03	ETP	.64787349	01	TEP	.20642167	02	TSP	.11165996	03	TSP	.10584016	00	STP	.68234360	02
SET	.10594022	03	STE	.73918396	02	EST	.14144723	00	RPM	.29590945	06	RPT	.29590945	06	SPN	.88498637	02
GCE	.11583113	03	GCT	.28295301	03	SIP	.11132344	03	CPT	.76996933	02	SIN	.76660407	02	D1	.17620559	00
REP	.94711784	05	VEP	.26431146	01	CPE	.11565869	03	CPS	.92623858	02	D2	.65696188	-01	D3	.41322949	-03

ECLIPTIC COORDINATES

0 DAYS 8 HRS. 18 MIN. 45.000 SEC.

JULIAN DATE 2437956.58064815

OCT. 19, 1962 01 56 08.000

CASE 1

SPACE TRAJECTORIES

6

RA-5 PREMIDCOURSE ORBIT

GEOCENTRIC

X -.50885405 05
R .10627396 06
R .10627396 06
XS -.13481210 09
XM -.65944631 05
XT -.65944631 05
RS .14900256 09
GED .99129450 01
DUT .34000000 02

Y .91512283 05
DEC .98471656 01
LAT .98471656 01
YS -.58223918 08
YM .35162703 06
YT .35162703 06
VS .29899396 02
ALT .99896383 05
DT .48000000 03

Z .18175038 05
RA .11907624 03
LON .62976114 02
ZS -.25247913 08
ZM .13671840 06
ZT .13671840 06
RM .38299109 06
LOS .14725887 03
DR .23686613 01

DX -.16386762 01
V .24638638 01
VE .74238285 01
DXS .13161679 02
DXM -.10148907 01
DXT -.10148907 01
VM .10229581 01
RAS .20335900 03
SHA -.10602975 06

DY .16995686 01
PTH .74020547 02
PTE .18606204 02
DYS -.24631075 02
DYM -.12429467 00
DYT -.12429467 00
RT .38299109 06
RAM .10062195 03
DES -.97554643 01

EQUATORIAL COORDINATES

DZ .70486263 00
AZ .63348249 02
AZE .27247846 03
DZS -.10679818 02
DZM .31478186-01
DZT .31478186-01
VT .10229581 01
LDM .44521815 02
DEM .20914560 02

GEOCENTRIC

EPOCH OF PERICENTER PASSAGE
SHA .27859639 06
VH .13051948 00
TA .15397633 03
WX .46631617 00
QX .45834181 00
SXO .75661881 00
BX -.45834179 00
B.T .46892240 05
C3J -.17798684 01

INC .28287315 02
C1 .72083848 05
MA .74075275 01
WZ .88058229 00
QZ .32211519 00
SZO -.34758701 00
BZ .32211518 00
B .60263880 05

JULIAN DATE 2437956.23212513
LAN .1 .964 03
SLR .13035827 05
DAD -.20339796 02
PX .75661881 00
RX -.74953308-01
TX -.64954596 00
MX -.74383261 00
PER .24390639 05

OCT. 18, 1962
RCA .65959960 04
TFP .30112388 05
MTA .18000000 03
PZ -.34758701 00
RZ -.88752190 00
YZ -.30247001 00
MZ .44195800 00
NOD -.72622272-02

EQUATORIAL COORDINATES

APF .22717816 03
APD .55059679 06
RAD .32379734 03
PY -.55381515 00
RY .45462823 00
TY -.69756859 00
MY -.50138435 00
OMD .11863935-01

HELIOCENTRIC

X .13476121 09
R .14899540 09
XE .13481210 09
XT .13474615 09
LTE .78636140-04
EPS .93844218 02
MPS .11222830 03
EPT .15146097 03
SET .10527545 03
GCE .11465484 03
REP .10627396 06

Y .63553473 08
LAT -.75091511-02
VE .63462283 08
VT .63839277 08
LOE .25208533 02
ESP .40178123-01
MSP .10159538 00
ETP .76181272 01
STE .74582575 02
GCT .28278572 03
VEP .24638638 01

Z -.19527250 05
LON .25248595 02
ZE .20450000 03
ZT -.14250750 05
LTT -.54760987-02
SEP .86115007 02
SMP .67669872 02
TEP .20920897 02
EST .14230920 00
SIP .11188042 03
CPE .11437363 03

DX -.14800355 02
V .32279400 02
DXE -.13161679 02
DXT -.14176569 02
LOT .25350396 02
EPM .15146097 03
SEM .10327545 03
TPS .11222830 03
RPM .28624987 06
CPT .77170306 02
CPS .92638092 02

DY .28686377 02
PTH -.20422667 01
DYE .26846677 02
DYT .26745165 02
RST .14910392 09
EMP .76181272 01
EMS .74582575 02
TSP .10159538 00
RPT .28624987 06
SIN .76822426 02
DZ .69596876-01

ECLIPTIC COORDINATES

DZ -.30385732-01
AZ .90054237 02
DZE -.92506408-03
DZT .77403306-01
VST .30270199 02
MEP .20920897 02
ESM .14230920 00
STP .67669872 02
SPN .90403561 02
D1 .18215191 00
D3 .45427388-03

215552316167 613727662776 614552267631 202723065212 204470112412 602556350055
621001817 621001817 3723000 000000000000

APPENDIX E TABLES (Cont'd)

Orbit Determination Program Printout

II. RANGER 5 POSTMIDCOURSE ORBIT

CASE 1

SPACE TRAJECTORIES

1

RA-5 PCSTIMICCOURSE ORBIT
EPHEMERIDES WITH VENUS VELOCITIES

GME .39860320 C6 J .162345CC-02 F -.57499999-05 D .78749999-05 RE .63781650 C4 REM .63783149 C4
 G .66709598-19 A .88745598 29 B .88763598 25 C .88800598 29 DME .41780741-C2 AU .14959900 C9
 GMM .49007589 C4 GMS .13271544 12 GMV .32476550 C6 GMA .42977759 C5 GMC .00000000 C0 GMJ .12671060 C9

INJECTION CONDITIONS

MCCN JULIAN DATE 2437956.58064815 OCT. 19, 1962 C1 56 C8.000

GECCENTRIC XC-.50885925 05 YC .91512069 05 ZC .18173407 C5 DXC-.16380212 C1 DY0 .16998046 01 DZ0 .70499460 C0
 CARTESIAN GME .00000000 C0 SGC .00000000 C0 TO .69675959 C4 GHA .56100134 C2 GHC .26987313 C2

C DAYS C HRS. C MIN. C SEC.

OCT. 19, 1962 C1 56 C8.000

GECCENTRIC

ECLATORIAL COORDINATES

X -.50885922 C5 Y .91512065 C5 Z .18173406 C5 DX -.16380211 C1 DY .16598045 C1 DZ .70499457 C0
 R .10627374 C6 DEC .98462939 C1 RA .11907655 C3 V .24636286 C1 PTH .74032094 C2 AZ .63307776 C2
 R .10627374 C6 LAT .98462939 C1 LCN .62976418 C2 VE .74244739 C1 PTE .18603799 C2 AZE .27247972 C3
 XS -.13481210 C9 YS -.58223920 C8 ZS -.25247514 08 EXS .13161679 C2 DYS -.24631075 C2 DZS -.10679618 C2
 XM -.65944638 C5 YM .35162703 C6 ZM .13671840 C6 CXM -.10148507 C1 DYM -.12429469 C0 DZM .31478175-C1
 XT -.65944638 C5 YT .35162703 C6 ZT .13671840 C6 DXT -.10148507 C1 DYT -.12429469 C0 DZT .31478175-C1
 RS .14500256 C9 VS .25899396 C2 RM .38259109 C6 VM .10229581 C1 RT .38299109 C6 VT .10229581 C1
 GED .99120677 C1 ALT .95896163 05 LGS .14725887 C3 RAS .20335500 C3 RAM .10062195 C3 LCM .44521816 C2
 CLT .34000000 C2 DT .24000000 C3 DR .23685719 C1 SHA -.10602547 C6 DES -.97554643 C1 DEM .20914560 C2

GECCENTRIC

EQUATORIAL COORDINATES

EPOCH OF PERICENTER PASSAGE
 SPA .27835862 06 ECC .97634232 C0 JULIAN DATE 2437956.23215275 OCT. 18, 1962 17 34 17.998
 VH .13092513 C0 C3 -.14319772 C1 INC .28324781 C2 LAN .10029226 C3 APF .22712511 03 RCA .65853187 C4
 TA .15400054 C3 EA .50713921 C2 MA .74164622 C1 SLR .13014844 C5 SLP .55013192 06 TFP .30100002 C5
 WX .46683455 C0 WY .84773099-C1 WZ .88027222 C0 PX .75628616 C0 RX -.28046945 C0 PY -.55419180 C0 PZ -.34771056 00
 CX .45836316 C0 CY .82806104 C0 QZ -.32282861 C0 RX -.28046945 C0 RY .20552256 C0 RZ -.93760189 C0
 SX0 .75628616 C0 SY0 -.55419180 C0 SZC -.34771056 C0 TX -.59107368 C0 TX -.59107368 C0 TY -.80661757 C0 TZ .00000000 C0
 BX -.45836313 C0 BY -.82806097 C0 BZ .32282858 C0 MX -.74350365 C0 MY -.50132269 C0 MZ .44258112 C0
 B.T .56509357 05 E.R -.20724085 05 B .60189660 C5 PER .24359324 C5 GMD .11506212-C1 NCD -.72924592-C2
 C3J -.17807014 C1

HELICENTRIC

ECLIPTIC COORDINATES

X .13476121 C9 Y .62553474 C8 Z -.15929250 C5 DX -.14799700 C2 DY .28686646 C2 DZ -.30358553-C1
 R .14899540 C9 LAT -.75099204-C8 LON .25248595 02 V .32279338 C2 PTH .20410150 01 AZ .90050189 02
 XE .13481210 C9 YE .63462286 C8 ZE .20400000 C3 CXE -.13161679 C2 DYE .26846677 C2 DZE -.92506408-C3
 XT .13476121 C9 YT .63839281 08 ZT -.14251000 C5 DXT -.14176570 C2 DYT .26745164 C2 DZT .77403187-C1
 LTE .78443675-C4 LCE .25208534 C2 LTT -.54761947-02 LGT .25350397 C2 RST .14510392 C9 VST .30270199 C2
 EPS .93844673 C2 ESP .41377734-C1 SEP .86114552 02 EPM .15146001 C3 EMP .76183525 C1 MEP .20921633 02
 MPS .11222841 C3 MSP .10207574 C0 SPM .67669761 C2 SEM .10527545 C3 EMS .74582525 C2 ESM .14265252 C0
 EPT .15146001 C3 ETP .76183525 01 TEP .20921633 C2 TPS .11222841 C3 TSP .10207574 C0 STP .67669761 C2
 SET .10527545 C3 STE .74582525 C2 EST .14265252 00 RPM .28625072 C6 RPT .28625072 C6 SPN .90404008 C2
 GCE .11465564 C3 GCT .28625072 03 SIP .11188053 03 CPT .77170591 C2 SIN .76822711 C2 D1 .18215137 00
 REP .10627374 C6 VEP .24636286 C1 CPE .11437440 C3 CPS .92638053 C2 D2 .69596995-C1 D3 .45427365-C3

C DAYS 2 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437956.66666666

OCT. 19, 1962 04 C0 C0.000

2

SPACE TRAJECTORIES

CASE 1

RA-5 PCSTWIDCOURSE OREIT

GEOCENTRIC

X -.62628797 C5
R .12309943 C6
R .12309943 C6
XS -.13471413 C9
XM -.73473394 C5
YT -.73473394 C5
RS .14899904 C9
GEC .10962806 C2
DUT .34000000 C2

Y .10339344 C6
DEC .10890383 C2
LAT .10890383 C2
YS -.58406921 C8
YM .35063342 C6
YT .35063342 C6
VS .25900337 C2
ALT .11672199 C6
DT .95999995 C3

Z .23257251 C5
RA .12120466 C3
LCN .34053081 C2
ZS -.23268600 C8
ZM .13692515 C6
ZT .13692515 C6
RM .38352396 C6
LCS .11628814 C3
DR .21685060 C1

DX -.15263563 C1
V .22460394 C1
VE .85733311 C1
DXS .13201508 C2
DXM -.10110773 C1
DXT -.10110773 C1
VM .10214354 C1
RAS .20343572 C3
SHA -.12249921 C6

EQUATORIAL COORDINATES

DY .15077636 C1
PTH .74501605 C2
PTE .14651329 C2
DYS -.24613912 C2
DYM -.14307037 C0
DYT -.14307037 C0
RT .38252396 C6
RAM .10183479 C3
DES -.97866586 C1

CZ .66442157 C0
AZ .63680271 C2
AZE .27179211 C3
DZS -.10672165 C2
DZM .24163526 C1
DZT .24163526 C1
VT .10214354 C1
LCM .14683213 C2
DEM .20917204 C2

HELICENTRIC

X .13465150 C9
R .14898695 C9
XE .13471413 C9
YT .13464065 C9
LCE .76042369 C4
EPS .95613226 C2
MPS .11305179 C3
EPT .14950143 C3
SET .10423246 C3
GCE .11322539 C3
REP .12309943 C6

Y .63765859 C8
LAT -.75366891 C2
YE .63661747 C8
YT .64037512 C8
LCE .25293976 C2
ESP .46393702 C1
MSP .96407213 C1
ETP .93751004 C1
STE .75624679 C2
GCT .28256752 C3
VEP .22460394 C1

Z .19597750 C5
LCN .25340465 C2
ZE .15775000 C3
ZT .13672250 C5
LTT -.2541568 C2
SEP .84339662 C2
SMP .66851903 C2
TEP .21123459 C2
EST .14230520 C3
SIP .11268613 C3
CPE .11279874 C3

DX -.14728305 C2
V .32059055 C2
DXE -.13201908 C2
DXT -.14212586 C2
LOT .25436738 C2
EPM .14950143 C3
SEM .10423246 C3
TPS .11305179 C3
RPM .27233362 C6
CPT .77398211 C2
CPS .52660232 C2

DY .28475603 C2
PTH .20086869 C1
DYE .26827966 C2
DYT .26706317 C2
RST .14909380 C9
EMP .93751004 C1
EMS .75624679 C2
TSP .96407213 C1
RPT .27233362 C6
SIN .77302553 C2
D2 .75707494 C1

ECLIPTIC COORDINATES

CZ .88082551 C2
AZ .89984509 C2
DZE -.93436240 C3
DZT .78152537 C1
VST .30252974 C2
MEP .21123459 C2
ESM .14230520 C0
STP .66851903 C2
SPN .92644330 C2
D1 .19146025 C0
D3 .52239764 C0

C DAYS 6 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437956.83333333

CCT. 19, 1962

C8 00 C0.CCC

GEOCENTRIC

X -.83380713 C5
R .15220970 C6
R .15220970 C6
XS -.13452345 C9
XM -.87973703 C5
YT -.87973703 C5
RS .14899222 C9
GEC .12357202 C2
DUT .34000000 C2

Y .12315872 C6
DEC .12276105 C2
LAT .12276105 C2
YS -.58761142 C8
YM .34831339 C6
YT .34831339 C6
VS .25502161 C2
ALT .14583247 C6
DT .15200000 C4

Z .32363268 C5
RA .12409872 C3
LCN .33678287 C3
ZS -.25480444 C6
ZM .13717138 C6
ZT .13717138 C6
RM .38454853 C6
LCS .56280317 C2
DR .18930599 C1

DX -.13652079 C1
V .19512498 C1
VE .10592154 C2
DXS .13279794 C2
DXM -.10026111 C1
DXT -.10026111 C1
VM .10185261 C1
RAS .20359617 C3
SHA -.15072944 C6

DY .12567584 C1
PTH .75972179 C2
PTE .10295378 C2
DYS -.24580494 C2
DYM -.17906824 C0
DYT -.17906824 C0
RT .38454853 C6
RAM .10417477 C3
DES -.98470494 C1

EQUATORIAL COORDINATES

CZ .60344145 C0
AZ .64228570 C2
AZE .27113061 C3
DZS -.10657656 C2
DZM .10049267 C1
DZT .10049267 C1
VT .10185261 C1
LCM .31685892 C3
DEM .20898133 C2

HELICENTRIC

X .13444406 C9
R .14897112 C9
XE .13444406 C9
YT .13443347 C9
LCE .70662071 C4
EPS .97539240 C2
MPS .11444780 C3
EPT .14643662 C3
STE .10222062 C3
GCE .11127601 C3
REP .15220970 C6

Y .64173700 C8
LAT -.73540308 C2
YE .64047832 C8
YT .64421566 C8
LOE .25459542 C2
ESP .58516955 C1
MSP .87356456 C1
ETP .12640281 C2
STE .77634928 C2
GCT .28224603 C3
VEP .15512498 C1

Z .19120750 C5
LCN .25517037 C2
ZE .18375000 C3
ZT .12537500 C5
LTT -.48187165 C2
SEP .82002785 C2
SMP .65465286 C2
TEP .20923089 C2
EST .14486432 C2
SIP .11404690 C3
CPE .11063851 C3

DX -.14645002 C2
V .31762430 C2
DXE .13279794 C2
DXT -.14282405 C2
LOT .25603099 C2
EPM .14643662 C3
SEM .11222062 C3
TPS .11444780 C3
RPM .24839577 C6
CPT .77737483 C2
CPS .92702534 C2

DY .28184626 C2
PTH .19397925 C1
DYE .26751535 C2
DYT .26631245 C2
RST .14907410 C9
EMP .12640281 C2
EMS .77634928 C2
TSP .87356456 C1
RPT .24839577 C6
SIN .77336586 C2
D2 .87721065 C1

ECLIPTIC COORDINATES

CZ .52702307 C1
AZ .89905123 C2
DZE -.95140933 C3
DZT .79507469 C1
VST .30215474 C2
MEP .20923089 C2
ESM .14486432 C0
STP .65465286 C2
SPN .95537689 C2
D1 .20591209 C0
D3 .67043186 C0

C DAYS 10 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437957.00000000

OCT. 19, 1962

12 00 C0.CCC

CASE 1

SPACE TRAJECTORIES

3

RA-5 PCSTMIDCOURSE ORBIT

GEOCENTRIC

GEOCENTRIC				EQUATORIAL CCORINATES			
X	-10214788 06	Y	-13997761 06	Z	-40706006 05	DX	-12465539 01
R	17800252 06	CEC	13219499 02	RA	12611989 03	PTH	-10888186 01
R	17800252 06	LAT	13219499 02	LON	27163977 03	PTE	-76619537 02
XS	-13433165 09	YS	-59114880 08	ZS	-25633818 08	DYS	-24546861 02
XM	-10234204 06	YM	34547881 06	ZM	13721500 06	DYM	-21452697 02
XT	-10234204 06	YT	34547881 06	ZT	13721500 06	DYT	-21452697 02
RS	14898541 09	VS	29903986 02	RM	38556122 06	RT	-38556122 06
GED	13306392 02	ALT	17162544 06	LOS	35627257 03	RAM	-10650100 03
DLT	34000000 02	DT	19200000 04	DR	16990021 01	DES	-99073754 01

HELIOCENTRIC

HELIOCENTRIC				EQUATORIAL CCORINATES			
X	13422950 09	Y	-64578006 08	Z	-18171500 05	DX	-14604192 02
R	14895596 09	LAT	-65896514-02	LON	25692274 02	PTH	-18739008 01
XE	13433165 09	YE	-64433388 08	ZE	16175000 03	DYE	-26754868 02
XT	13422950 09	YT	-64804939 08	ZT	-11383250 05	DYT	-26556468 02
LTE	65281279-04	LCE	-25625126 02	LTT	-43756680-02	RST	-14905431 09
EPS	99490440 02	ESP	-67448792-01	SEP	80442039 02	EMP	-15727349 02
MPS	11563072 03	MSP	-75437864-01	SMP	64290589 02	EMS	-79633639 02
EPT	14404655 03	ETP	-15727349 02	TEP	20226092 02	TSP	-79437864-01
SET	10020050 03	STE	-75633639 02	EST	-14620800 00	RPT	-22703473 06
GCE	10990748 03	GCT	-28200591 03	SIP	-11519211 03	SIN	-77553856 02
REP	17800252 06	VEP	-17464086 01	CPE	10912008 03	D2	-10031855 00

C DAYS 14 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437957.16666666

OCT. 19, 1962 16 00 00.000

GEOCENTRIC

GEOCENTRIC				EQUATORIAL CCORINATES			
X	-11940236 06	Y	-15472732 06	Z	-48453139 05	DX	-11531748 01
R	20135832 06	CEC	13923810 02	RA	12765720 03	PTH	-77041066 02
R	20135832 06	LAT	13923810 02	LON	22001282 03	PTE	-63525958 01
XS	-13413873 09	YS	-55468127 08	ZS	-25786980 08	DYS	-24513012 02
XM	-11655859 06	YM	34213777 06	ZM	13705750 06	DYM	-24940537 00
XT	-11655859 06	YT	34213777 06	ZT	13705750 06	DYT	-24940537 00
RS	14897861 09	VS	29903986 02	RM	38656036 06	RT	-38656036 06
GED	14014570 02	ALT	15498136 06	LOS	29626490 03	RAM	-10881281 03
DLT	34000000 02	DT	19200000 04	DR	15507742 01	DES	-99676338 01

HELIOCENTRIC

HELIOCENTRIC				EQUATORIAL CCORINATES			
X	13401933 09	Y	-64979642 08	Z	-16945500 05	DX	-14588491 02
R	14894138 09	LAT	-65187095-02	LON	25866554 02	PTH	-18134553 01
XE	13413873 09	YE	-64818411 08	ZE	15650000 03	DYE	-26717968 02
XT	13413873 09	YT	-65186834 08	ZT	-10212250 05	DYT	-26482034 02
LTE	60188434-04	LCE	-25790724 02	LTT	-39260641-02	RST	-14903445 09
EPS	10061618 03	ESP	-76296776-01	SEP	79307707 02	EMP	-18651642 02
MPS	11663750 03	MSP	-71326247-01	SMP	63291250 02	EMS	-81621073 02
EPT	14212316 03	ETP	-18651642 02	TEP	19225197 02	TSP	-71326247-01
SET	98231844 02	STE	-81621073 02	EST	-14720910 00	RPT	-20731978 06
GCE	10885987 03	GCT	-28181606 03	SIP	-11415718 03	SIN	-77712996 02
REP	20135832 06	VEP	-15913030 01	CPE	107966238 03	D2	-11388891 00

C DAYS 18 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437957.33333333

OCT. 19, 1962 20 00 00.000

SPACE TRAJECTORIES

CASE 1

RA-5 PCSTMIDCOURSE ORBIT

GEOCENTRIC

X	-13543800	C6	Y	-16791024	O6	Z	.55714283	C5	DX	-10762576	C1	DY	.86923134	O0	DZ	.48929426	CC
R	.22280347	O6	DEC	-14481075	O2	RA	.14674135	C1	V	.15505768	C2	PTH	.77326918	C2	AZ	.65089224	O2
R	.22280346	O6	LAT	-14481075	O2	LON	.16108132	O3	VE	.13512950	C2	PTE	.52977260	O1	AZE	.27050321	O3
XS	-13394470	O9	YS	-59820888	O8	ZS	-.25939931	O8	DXS	.13512950	C2	DYS	-.24478945	O2	DZS	-.10613578	O2
XM	-13060414	O6	YM	.33829887	O6	ZM	.13670059	O6	DXM	-.96900627	CC	DYM	-.28366454	CC	DZM	-.31664949	-O1
XT	-13060414	O6	YT	.33829887	O6	ZT	.13670059	O6	DXT	-.96900627	CC	DYT	-.28366454	CC	DZT	-.31664949	-O1
RS	.14897181	O9	VS	.29907634	O6	RM	.38754434	C6	VM	.10101690	C1	RT	.38754434	O6	VT	.10101690	O1
GEO	.14575571	O2	ALT	-21642661	O6	LOS	.23625731	O3	RAS	.20406596	C3	RAM	.11110905	O3	LOM	.14330100	O3
DLT	.34000000	C2	DT	.15200000	O4	DR	.14316640	C1	SHA	-.21828388	C6	DES	-.10027826	O2	DEM	.20654712	C2

EQUATORIAL COORDINATES

HELIOCENTRIC

X	.13380926	O9	Y	.65379119	O8	Z	-.15542250	O5	DX	-.14589208	C2	DY	.27672972	O2	DZ	.10210633	CC
R	.14892732	O9	LAT	-.55794622	-O2	LON	.26040105	O2	V	.31283363	C2	PTH	-.17581300	O1	AZ	.89813084	O2
XE	.13394470	O9	YE	.65202903	O8	ZE	.14225000	C3	DXE	-.13512950	C2	DYE	.26680832	O2	DZE	-.99253654	-O3
XT	.13381409	O9	YT	.65567663	O8	ZT	-.90267500	C4	DXT	-.14481957	C2	DYT	.26407984	C2	DZT	.82807063	-O1
LTE	.54710513	-O4	LCE	.25956342	O2	LTT	-.34707667	-O2	LOT	.26104424	C2	RST	.14901453	O9	VST	.30118359	O2
EPS	.10147615	O3	ESP	.84759127	-O1	SEP	.78439870	O2	EPM	.14054510	C3	EMP	.21426537	C2	MEP	.18024361	O2
MPS	.11749071	O3	MSP	.64482543	-O1	SMP	.62444491	O2	SEM	.96254371	C2	EMS	.83597502	O2	ESM	.18024361	O2
ETP	.14054510	O3	ETP	.21426537	O2	TEP	.18024361	O2	TPS	.11749071	C3	TSP	.64482543	-O1	STP	.62444491	O2
SET	.96254371	O2	STE	.83597502	O2	EST	.14803752	O0	RPM	.18871786	C6	RPT	.18871786	C6	SPN	.59835769	O2
GCE	.10801370	O3	GCT	.28165963	O3	SIP	.11696303	C3	CPT	.78356291	C2	SIN	.77828616	O2	C1	.27629717	CC
REP	.22280347	O6	VEP	.14674135	O1	CPE	.10703049	C3	CPS	.92826899	C2	D2	.12886210	CC	C3	.13277826	-O2

ECLIPTIC COORDINATES

C DAYS 22 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437957.50000000

OCT. 20, 1962

OC CC CO.000

GEOCENTRIC

X	-15045388	O6	Y	-17984854	O6	Z	-.62566701	O5	DX	-.10109105	C1	DY	.79141129	O0	DZ	.46309256	CC
R	.24268592	O6	DEC	-14940116	O2	RA	.12991446	C3	V	.13648174	C1	PTH	.77526435	C2	AZ	.65185218	O2
R	.24268592	O6	LAT	-14940116	O2	LON	.10194149	O3	VE	.16884262	C2	PTE	.45268171	O1	AZE	.27042114	O3
XS	-13374954	O9	YS	-.60173155	O8	ZS	-.26092667	O8	DXS	.13590498	C2	DYS	-.24444663	O2	DZS	-.10598701	O2
XM	-14445593	O6	YM	.33397133	O6	ZM	.13614623	C6	DXM	-.95519137	CC	DYM	-.31726768	CC	DZM	-.45302295	-O1
XT	-14445593	O6	YT	.33397133	O6	ZT	.13614623	C6	DXT	-.95519137	CC	DYT	-.31726768	CC	DZT	-.45302295	-O1
RS	.14896502	O9	VS	.25909457	O2	RM	.38851167	C6	VM	.10075225	C1	RT	.38851167	O6	VT	.10075225	O1
GEO	.15037332	O2	ALT	.23630915	O6	LOS	.17624973	O3	RAS	.20422271	C3	RAM	.11339099	O3	LOM	.85418015	O2
DLT	.34000000	C2	DT	.15200000	O4	DR	.13326020	C1	SHA	-.23716319	C6	DES	-.10087952	O2	DEM	.20513631	O2

EQUATORIAL COORDINATES

HELIOCENTRIC

X	.13359509	O9	Y	.65776750	O8	Z	-.14019750	O5	DX	-.14601408	C2	DY	.27553780	C2	DZ	.10901606	CC
R	.14891373	O9	LAT	-.53942138	-O2	LON	.28213066	O2	V	.31183710	C2	PTH	-.17071298	O1	AZ	.89799768	O2
XE	.13374954	O9	YE	.65586856	O8	ZE	.12750000	C3	DXE	-.13590498	C2	DYE	.26643460	C2	DZE	-.10032654	-O2
XT	.13360508	O9	YT	.65947423	O8	ZT	-.78285000	O4	DXT	-.14545689	C2	DYT	.26334358	O2	DZT	.83652572	-O1
LTE	.49039780	-O4	LOE	.26121977	O2	LTT	-.30104453	-O2	LQT	.26270930	C2	RST	.14899457	O9	VST	.30084588	O2
EPS	.10215545	O3	ESP	.90923484	-O1	SEP	.77753299	C2	EPM	.13925469	C3	EMP	.24061136	O2	MEP	.16684173	O2
MPS	.11820402	O3	MSP	.58097472	-O1	SMP	.61738000	C2	SEM	.94287798	C2	EMS	.85563215	O2	ESM	.14869693	CC
EPT	.13925469	O3	ETP	.24061136	O2	TEP	.16684173	O2	TPS	.11820402	C3	TSP	.58097472	-O1	STP	.61738000	O2
SET	.94287798	O2	STE	.85563215	O2	EST	.14869693	O0	RPM	.17089093	C6	RPT	.17089093	O6	SPN	.10064949	O3
GCE	.10730470	O3	GCT	.28152592	O3	SIP	.11762130	O3	CPT	.78491503	C2	SIN	.77900870	O2	C1	.30312266	CC
REP	.24268592	O6	VEP	.13648174	O1	CPE	.10625334	C3	CPS	.92867847	C2	D2	.14577493	CC	C3	.16683118	-O2

ECLIPTIC COORDINATES

1 DAYS 2 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437957.66666666

OCT. 20, 1962

04 00 00.000

CASE 1

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RA-5 PCSTMIIDCOURSE ORBIT

SPACE TRAJECTORIES

GEOCENTRIC

X	-16459301	C6	Y	.19076569	06	Z	-.69068197	05	DX	-.95408124	CC	DY	-.72674670	00	DZ	-.44041650	C0
R	.26125241	C6	DEC	.15329724	02	RA	.13078769	C3	V	.12776535	C1	PTH	.77671107	02	AZ	.65183198	C2
R	.26125240	C6	LAT	.15329725	02	LON	.42650450	C2	VE	.18168676	C1	PTE	.39393227	C1	AZE	.27036195	C3
XS	-.13355327	C9	YS	-.60524926	08	ZS	-.26245218	08	DXS	.13667958	C2	DYS	-.24410164	C2	DZS	-.10583731	C2
XM	-.15810777	C6	YM	.32916484	06	ZM	.13539665	06	DXM	-.94013208	CC	DYM	-.35017975	00	DZM	-.58778717	-C1
XT	-.15810777	C6	YT	.32916484	06	ZT	.13539665	06	DXT	-.94013208	CC	DYT	-.35017975	00	DZT	-.58778717	-C1
RS	.14895823	C9	VS	.25911277	02	RM	.38946093	C6	VM	.10049523	C1	RT	.38946093	C6	VT	.10049523	C1
GED	.15429232	02	ALT	.25487571	06	LOS	.11624229	03	RAS	.20437953	C3	RAM	.11565637	C3	LOM	.27519133	C2
DUT	.34000000	02	CT	.19200000	04	DR	.12481883	01	SHA	-.25475753	C6	DES	-.10148010	C2	DEM	.20343733	C2

HELIOCENTRIC

X	.13338868	C9	Y	.66172766	08	Z	-.12412250	C5	DX	-.14622039	C2	DY	.27447825	C2	DZ	.11352844	C0
R	.14890055	C9	LAT	-.47761374	-C2	LON	.26385541	02	V	.31099841	C2	PTH	-.16596395	C1	AZ	.89790156	C2
XE	.13355327	C9	YE	.65970270	08	ZE	.11325000	03	DXE	-.13667958	C2	DYE	.26605853	C2	DZE	-.10122061	-C2
XT	.13339517	C9	YT	.66326129	08	ZT	-.66182499	04	DXT	-.14608090	C2	DYT	.26261194	C2	DZT	.84373473	-C1
LTE	.43560849	-04	LOE	.26287630	02	LTT	-.25453857	-C2	LOT	.26437271	C2	RST	.14897458	C9	VST	.30050852	C2
MPS	.10270413	C3	ESP	.97667492	-01	SEP	.77197833	02	EPM	.13819787	C3	EMP	.26559825	C2	MEP	.15242303	C2
EPT	.13819787	03	ETP	.26559825	02	TSP	.61163889	02	SEM	.92331820	C2	EKS	.87518513	C2	ESM	.14951711	C0
SET	.92331820	C2	STE	.87518513	02	EST	.15242303	C2	TPS	.11878433	C3	TSP	.52339155	-01	STP	.61163889	C2
GCE	.10665960	03	GCT	.28140726	C3	SIP	.11813605	03	RPM	.15360940	C6	RPT	.15360940	C6	SPN	.10130522	C3
REP	.26125241	C6	VEP	.12776535	01	CPE	.10587953	C3	CPS	.92508622	C2	DZ	.77957778	C2	D1	.33945408	C0

1 DAYS 6 HRS. 3 MIN. 52.000 SEC.

GEOCENTRIC

X	-.17796259	06	Y	.20082659	06	Z	.75264350	05	DX	-.90375510	CC	DY	.67207732	00	DZ	.42059600	C0
R	.27868751	C6	DEC	.15668263	C2	RA	.13154577	C3	V	.12022322	C1	PTH	.77784730	02	AZ	.65063240	C2
R	.27868750	C6	LAT	.15668263	C2	LCN	.34324427	C3	VE	.19372374	C2	PTE	.34773551	C1	AZE	.27031778	C3
XS	-.13335589	C9	YS	-.60876198	08	ZS	-.26397493	08	DXS	.13745329	C2	DYS	-.24375448	C2	DZS	-.10568670	C2
XM	-.17153003	C6	YM	.32388960	06	ZM	.13445425	06	DXM	-.92386647	CC	DYM	-.38236783	C0	DZM	-.72079007	-C1
XT	-.17153003	C6	YT	.32388960	06	ZT	.13445425	06	DXT	-.92386647	CC	DYT	-.38236783	C0	DZT	-.72079007	-C1
RS	.14895144	C9	VS	.25913095	02	RM	.39039079	C6	VM	.10024619	C1	RT	.39039079	C6	VT	.10024619	C1
GED	.15769744	02	ALT	.27231087	C6	LOS	.56334914	02	RAS	.20453642	C3	RAM	.11790543	03	LOM	.32960392	C3
DUT	.34000000	02	CT	.19200000	04	DR	.11750131	01	SHA	-.27125963	C6	DES	-.10207999	02	DEM	.20145745	C2

ULIAN DATE 2437957.83333333

OCT. 20, 1962

EQUATORIAL COORDINATES

HELIOCENTRIC

X	.13317793	C9	Y	.66567322	08	Z	-.10744500	C5	DX	-.14649084	C2	DY	.27351940	C2	DZ	.11748564	C0
R	.14888778	C9	LAT	-.41347550	-C2	LON	.26557604	02	V	.31028021	C2	PTH	-.16148992	C1	AZ	.89783081	C2
XE	.13335589	C9	YE	.66353139	08	ZE	.08999999	C2	DXE	-.13745329	C2	DYE	.26568011	C2	DZE	-.10197162	-C2
XT	.13318436	C9	YT	.66703784	08	ZT	-.53987499	C4	DXT	-.14669196	C2	DYT	.26188529	02	DZT	.84968923	-C1
LTE	.38081417	-04	LOE	.26453299	02	LTT	-.20766435	-C2	LOT	.26603447	C2	RST	.14895459	C9	VST	.30017188	C2
EPS	.10315368	C3	ESP	.10444440	C0	SEP	.76741925	02	EPM	.13735524	C3	EMP	.28921470	C2	MEP	.13723280	C2
MPS	.11923187	C3	MSP	.47436387	-01	SMP	.60722237	C2	SEM	.90386132	C2	EMS	.89463704	C2	ESM	.15033281	C0
EPT	.13735524	C3	ETP	.28921470	02	TEP	.13723280	C2	TPS	.11923187	C3	TSP	.47436387	-C1	STP	.60722237	C2
SET	.90386132	C2	STE	.89463704	02	EST	.15033281	00	RPM	.13670891	C6	RPT	.13670891	C6	SPN	.10184231	C3
GCE	.10615886	C3	GCT	.28129729	03	SIP	.11850344	03	CPT	.78705521	C2	SIN	.77977093	C2	D1	.38142515	C0
REP	.27868751	C6	VEP	.12022322	01	CPE	.10587953	C3	CPS	.92549252	C2	DZ	.18861012	C0	C3	.27189408	-C2

1 DAYS 10 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437958.00000000

OCT. 20, 1962

EQUATORIAL COORDINATES

CASE 1

SPACE TRAJECTORIES

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RA-5 PSTMIDCOURSE ORBIT

GEOCENTRIC

EQUATORIAL CCORDINATES

X	-	.19C64566	C6	Y	.21015989	C6	Z	.81193069	O5	DX	-.85853471	CC	DY	-.62543717	C0	DZ	.40322424	O0
R		.29513600	C6	DEC	.15968206	O2	RA	.13221261	C3	V	.11361528	C1	PTH	.77889271	O2	AZ	.64787556	C2
R		.29513600	C6	LAT	.15968206	C2	LON	.28374683	C3	VE	.20505936	C2	PTE	.31053592	O1	AZE	.27028412	C3
XS	-	.13315739	C9	YS	-.61226970	O8	ZS	-.26549581	C8	DXS	.13822611	C2	DYS	-.24340515	C2	DZS	-.10553516	C2
XM	-	.18470561	C6	YM	.31815623	C6	ZM	.13332168	C6	DXM	-.90643291	CC	DYM	-.41380090	C0	DZM	-.85188603	O1
XT	-	.18470561	C6	YT	.31815623	C6	ZT	.13332168	C6	DXT	-.90643291	CC	DYT	-.41380090	C0	DZT	-.85188603	O1
RS		.14894466	C9	VS	.25914511	C2	RM	.39130002	C6	VM	.10000544	C1	RT	.39130002	O6	VT	.10000544	C1
GCD		.16071424	O2	ALT	.28875943	C6	LCS	.35622762	C3	RAS	.20469239	C3	RAM	.12013784	C3	LCM	.27167207	C3
DLT		.34000000	O2	DT	.19200000	C4	DR	.11100866	C1	SHA	-.28681808	C6	DES	-.10267920	O2	DEM	.19920424	O2

HELICENTRIC

ECLIPTIC CCORDINATES

X	.13296674	C9	Y	.66960577	C8	Z	-.90339999	C4	DX	-.14681146	C2	DY	.27264160	C2	DZ	.12009668	CC
R	.14887536	C9	LAT	-.34764165	C2	LON	.26729317	C2	V	.30965867	C2	PTH	-.15721618	C1	AZ	.89777797	C2
XE	.13315739	O9	YE	.66735463	C8	ZE	.84000000	C2	DXE	-.13822611	C2	DYE	.26529932	C2	DZE	-.10257959	O2
XT	.13297268	C9	YT	.67080396	O8	ZT	-.41717500	C4	DXT	-.14729044	C2	DYT	.26116396	O2	DZT	.85440396	O1
LTE	.32312576	O4	LCE	.26618989	C2	LTT	-.16048952	C2	LOT	.26769459	C9	RST	.14893459	C9	VST	.29983632	C2
EPS	.10352473	O3	ESP	.10921114	C0	SEP	.76364880	C2	EPM	.13671909	C3	EMP	.31137390	C2	MEP	.12143521	C2
MPS	.11953868	C3	MSP	.40178123	C1	SMP	.60421127	O2	SEM	.88450408	C2	EMS	.91359109	C2	ESM	.15033281	O0
EPT	.13671509	C3	ETP	.31137390	C2	TEP	.12143521	O2	TPS	.11953868	C3	TSP	.40178123	O1	STP	.60421127	O2
SET	.88450408	O2	STE	.91359109	O2	EST	.15033281	CC	RPM	.12006598	C6	RPT	.12006598	O6	SPA	.10228645	C3
GCE	.10568082	C3	GCT	.28118988	C3	SIP	.11870528	C3	CPT	.77965473	C2	SIN	.77965473	C2	D1	.43430672	C0
REP	.29513600	C6	NEP	.11361528	C1	CPE	.10449099	O3	CPS	.92989755	C2	D2	.21709353	CC	D3	.35668807	O2

1 DAYS 14 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437958.16666666

OCT. 20, 1962

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GEOCENTRIC

EQUATORIAL CCORDINATES

X	-	.20270807	O6	Y	.21887205	C6	Z	-.86888005	C5	DX	-.81741156	CC	DY	.58568405	C0	DZ	.38811225	O0
R	.31071704	C6	DEC	.16238544	O2	RA	.13280427	O3	V	.10787879	C1	PTH	.78009939	O2	AZ	.64287402	O2	
R	.31071704	C6	LAT	.16238544	O2	LON	.22417423	C2	VE	.21578172	C2	PTE	.28007233	C1	AZE	.27025826	C3	
XS	-.13295778	C9	YS	-.61577234	O8	ZS	-.26701450	C8	DXS	.13899802	C2	DYS	-.24005364	O2	DZS	-.10538269	O2	
XM	-.19762997	O6	YM	.31197586	C6	ZM	.13200179	O6	DXM	-.88786592	CC	DYM	-.44444962	CC	DZM	-.98093580	O1	
XT	-.19762997	O6	YT	.31197586	C6	ZT	.13200179	O6	DXT	-.88786592	CC	DYT	-.44444962	CC	DZT	-.98093580	O1	
RS	.14893789	C9	VS	.25916723	O2	RM	.39218746	C6	VM	.95773283	CC	RT	.39218746	C6	VT	.95773283	CC	
GCD	.16343319	O2	ALT	.30434052	O6	LCS	.29622040	C3	RAS	.20485044	C3	RAM	.12235337	O3	LCM	.21372333	O3	
DLT	.34000000	O2	DT	.19200000	C4	DR	.10543616	C1	SHA	-.30155676	C6	DES	-.10327773	C2	DEM	.19668851	O2	

HELICENTRIC

ECLIPTIC CCORDINATES

X	.13275507	C9	Y	.67352606	O8	Z	-.72887500	C4	DX	-.14717213	C2	DY	.27180336	O2	DZ	.12204277	CC
R	.14886330	C9	LAT	-.28053562	O2	LON	.26900724	O2	V	.30911914	C2	PTH	-.15306163	C1	AZ	.89773785	O2
XE	.13295778	C9	YE	.67117234	O8	ZE	.69499999	O2	DXE	-.13899802	C2	DYE	.26491619	C2	DZE	-.10302067	O2
XT	.13276015	C9	YT	.67455573	O8	ZT	-.29382500	C4	DXT	-.14787672	C2	DYT	.26044830	O2	DZT	.85789322	O1
LTE	.26736357	O4	LCE	.26784693	O2	LTT	-.11305089	O2	LOT	.26933507	C2	RST	.14891463	O9	VST	.29950221	C2
EPS	.10383097	O3	ESP	.11577320	C0	SEP	.76052956	O2	EPM	.13629918	C3	EMP	.33186857	C2	MEP	.10513861	O2
MPS	.11968426	C3	MSP	.34970568	O1	SMP	.60281112	O2	SEM	.86524320	C2	EMS	.93325058	C2	ESM	.15033281	O0
EPT	.13629918	C3	ETP	.33186857	O2	TEP	.10513961	C2	TPS	.11968426	C3	TSP	.34970568	O1	STP	.60281112	O2
SET	.86524320	O2	STE	.93325058	O2	EST	.15033281	CC	RPM	.10358258	C6	RPT	.10358258	O6	SPN	.10265480	C3
GCE	.10524871	C3	GCT	.28107759	C3	SIP	.11872286	O3	CPT	.78879444	C2	SIN	.77918040	C2	D1	.50343734	O0
REP	.31071704	C6	NEP	.10778769	C1	CPE	.10402762	O3	CPS	.93030147	C2	D2	.25323148	O0	D3	.48225201	O2

1 DAYS 18 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437958.33333333

OCT. 20, 1962

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SPACE TRAJECTORIES

CASE 1

RA-5 PCSTMICCOURSE ORBIT

GEOCENTRIC

EQUATORIAL CCOORDINATES

X	-21420320	06	Y	.22705845	06	Z	.92381739	05	DX	-.77963554	CC	DY	.55240036	CC	DZ	.3753140C	00
R	.32553485	06	DEC	.16486203	02	RA	.13333127	03	V	.10265663	C1	PTH	.78182250	02	AZ	.63432220	02
R	.32553484	06	LAT	.16486204	02	LON	.16453697	03	VE	.22596591	C2	PTE	.25485809	01	AZE	.27023865	03
XS	-.13275106	09	YS	-.61926991	08	ZS	-.26853097	08	DXS	.13976501	C2	DYS	-.24269997	02	DZS	-.1052293C	02
XM	-.21027511	06	YM	.30535594	06	ZM	.13049762	06	DXM	-.86821603	CC	DYM	-.47428638	CC	DZM	-.11078C61	00
XT	-.21027511	06	YT	.30535594	06	ZT	.13049762	06	DXT	-.86821603	CC	DYT	-.47428638	CC	DZT	-.11078C61	00
RS	.14893112	09	VS	.29518532	06	RM	.35 C5208	06	VM	.99549937	CC	RT	.39305208	06	VT	.59549937	CC
GED	.16592396	02	ALT	.31915838	06	LOS	.23621326	03	RAS	.20500757	C3	RAM	.12455184	C3	LCM	.15575753	C3
DLT	.34000000	C2	DT	.19200000	C4	DR	.10048072	C1	SHA	-.31558460	C6	DES	-.10387555	C2	DEM	.19390880	02

HELIOCENTRIC

ECLIPTIC CCOORDINATES

X	.13254286	C9	Y	.67743520	C8	Z	-.55204599	C4	DX	-.14756536	C2	DY	.27109184	C2	DZ	.12353897	CC
R	.14885158	C9	LAT	-.21249444	-02	LON	.27071870	C2	V	.30865450	C2	PTH	-.14892186	C1	AZ	.89770645	02
XE	.13275106	C9	YE	.67498452	08	ZE	.54499599	C2	DXE	-.13976501	C2	DYE	.26453068	C2	DZE	-.10334253	-02
XT	.13254279	C9	YT	.67830522	08	ZT	-.17015000	04	DXT	-.14845117	C2	DYT	.25973858	C2	DZT	.86016296	-01
LTE	.20966873	-04	LCE	.26950415	C2	LTT	-.65474576	-03	LOT	.27100554	C2	RST	.14889469	C9	VST	.29916988	C2
EPS	.10408114	C3	ESP	.12134335	00	SEP	.75797383	C2	EPM	.13613145	C3	EMP	.35027092	C2	MEP	.88414463	C1
MPS	.11962356	C3	MSP	.28837468	-01	SMP	.60345273	C2	SEM	.84607534	C3	FMS	.95241885	C2	ESM	.15033281	CC
EPT	.13613145	C3	ETP	.35027092	C2	TEP	.88414463	01	TPS	.11962356	C3	TSP	.28837468	-01	STP	.60345273	C2
SET	.84607534	C2	STE	.95241885	02	EST	.15033281	CC	RPM	.87174383	C5	RPT	.87174383	05	SPN	.10295851	C3
GCE	.10485383	C3	GCT	.28095179	03	SIP	.11848318	C3	CPT	.78566179	C2	SIN	.77823795	02	C1	.59823035	CC
REP	.32553485	C6	VEP	.10265663	C1	CPE	.10360708	C3	CPS	.93070444	C2	D2	.30114650	CC	D3	.67918771	-02

1 DAYS 22 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437558.50000000

OCT. 21, 1962 00 00 00.000

GEOCENTRIC

EQUATORIAL CCOORDINATES

X	-.22517498	C6	Y	.23481442	C6	Z	.57771014	C5	DX	-.74464596	CC	DY	.52609707	CC	DZ	.36527249	00
R	.33968935	06	DEC	.16717052	C2	RA	.13379950	C3	V	.98219128	CC	PTH	.78465285	C2	AZ	.61948998	02
R	.33968934	06	LAT	.16717052	C2	LON	.10484087	C3	VE	.23570104	C2	PTE	.23595997	01	AZE	.27022469	03
XS	-.13255523	C9	YS	-.62276235	08	ZS	-.27004524	C8	DXS	.14053507	C2	DYS	-.24234412	02	DZS	-.10507499	02
XM	-.22262561	06	YM	.29832038	06	ZM	.12881241	C6	DXM	-.84751014	CC	DYM	-.50328507	CC	DZM	-.12323695	00
XT	-.22262561	06	YT	.29832038	06	ZT	.12881241	06	DXT	-.84751014	CC	DYT	-.50328507	CC	DZT	-.12323695	00
RS	.14892435	C9	VS	.29920337	C2	RM	.39389291	06	VM	.95335625	CC	RT	.39389291	06	VT	.95335625	CC
GED	.16824558	C2	ALT	.33331293	06	LOS	.17620614	C3	RAS	.20516477	C3	RAM	.12673313	03	LCM	.97774507	C2
DLT	.34000000	C2	DT	.19200000	C4	DR	.96235470	CC	SHA	-.32500803	C6	DES	-.10447267	02	DEM	.19088238	02

HELIOCENTRIC

ECLIPTIC CCOORDINATES

X	.13233306	C9	Y	.68133415	08	Z	-.37317500	04	DX	-.14798552	C2	DY	.27042270	02	DZ	.12478900	CC
R	.14884200	C9	LAT	-.14365307	-02	LON	.27242797	C2	V	.30826689	C2	PTH	-.14463395	C1	AZ	.89768024	C2
XE	.13255523	C9	YE	.67879111	08	ZE	.40000000	02	DXE	-.14053507	C2	DYE	.26414281	C2	DZE	-.10349750	-02
XT	.13233306	C9	YT	.68204052	08	ZT	-.46150000	03	DXT	-.14901417	C2	DYT	.25903510	C2	DZT	.86123227	-01
LTE	.15389230	-04	LCE	.27116155	02	LTT	-.17761232	-03	LOT	.27266519	C2	RST	.14887481	C9	VST	.29883967	02
EPS	.10427569	C3	ESP	.12647557	00	SEP	.75593662	C2	EPM	.13630232	C3	EMP	.36568606	C2	MEP	.71290734	C1
MPS	.11927208	C3	MSP	.22117325	-01	SMP	.60704167	02	SEM	.82699712	C2	ENS	.97149923	C2	ESM	.15065786	CC
EPT	.13630332	C3	ETP	.36568606	C2	TEP	.71290734	01	TPS	.11927208	C3	TSP	.22117325	-01	STP	.60704167	02
SET	.82699712	C2	STE	.97149923	02	EST	.15065786	CC	RPM	.70759003	C5	RPT	.70759003	05	SPN	.10320384	C3
GCE	.10485355	C3	GCT	.28079476	03	SIP	.11786462	C3	CPT	.79506658	C2	SIN	.77659130	C2	C1	.73708575	C3
REP	.33968935	C6	VEP	.98219128	00	CPE	.10322237	03	CPS	.93110652	C2	D2	.36845586	CC	D3	.10161150	-01

2 DAYS 2 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437558.66666666

OCT. 21, 1962 04 00 00.000

CASE 1

SPACE TRAJECTORIES

8

RA-5 PCST MIDCOURSE ORBIT

GEOCENTRIC

X -23566065 C6 Y -24225407 C6 Z -10392080 C6 DX -71208346 CC DY -50912159 00 DZ -35930933 C0
 R -35329261 C6 DEC -16936929 02 RA -13420958 C3 V -94624037 CC PTH -78972661 C2 AZ -59167510 C2
 R -35329260 C6 LAT -16936929 02 LON -45086694 C2 VE -24507446 C2 PTE -21718815 C1 AZE -27021703 C3
 XS -13235229 C9 YS -62624967 C8 ZS -2735727 08 DXS -14130818 C2 DYS -24198610 C2 DZS -10491974 C2
 XM -23467861 C6 YM -25086541 C6 ZM -12694955 C6 CXM -82579039 CC CDM -53142146 CC DZM -13545056 C0
 XT -23467861 C6 YT -25086541 C6 ZT -12694955 C6 DXT -82579039 CC DYT -53142146 CC DZT -13545056 C0
 RS -14891759 C9 VS -29922137 02 RM -35470507 C6 VM -99130489 CC RT -39470907 06 VT -99130489 C0
 GED -17045680 C2 ALT -34691623 C6 LOS -11619516 C3 RAS -20532205 C3 RAM -12889720 C3 LCM -39774315 C2
 CLT -34000000 C2 DT -19200000 C4 DR -92876901 CC SHA -34195509 C6 DES -10506908 C2 DEM -18761416 C2

EQUATORIAL COORDINATES

HELIOCENTRIC

X -13211663 C9 Y -68522415 C8 Z -19260000 C4 DX -14842902 C2 CY -26985300 C2 DZ -12607133 C0
 R -14882918 C9 LAT -74146526 C3 LON -27413553 C2 V -30798280 C2 PTH -13988381 C1 AZ -89765409 C2
 XE -13235229 C9 YE -68259211 08 ZE -25000000 C2 CXE -14130818 C2 DYE -26375258 C2 DZE -10349750 C2
 XT -13211761 C9 YT -68576575 C8 ZT -77874599 C3 ZT -14956609 C2 DXT -25833814 C2 DZT -86111187 C1
 LTE -96187055 C5 LCE -27281912 C2 LTT -25974867 C3 LCT -27431885 C2 RST -14885500 C9 VST -29851189 C2
 EPS -10442609 C3 ESP -13140749 00 SEP -75442261 C2 EPM -13702058 C3 MEP -37604087 C2 MEP -53753214 C1
 MFS -11841364 C3 MSP -18504685 C1 SMP -61567595 C2 SEM -80800509 C2 EMS -99049515 C2 ESM -15000707 C0
 EPT -13702058 C3 ETP -37604087 C2 TEP -53753214 C1 TPS -11841364 C3 TSP -18504685 C1 STP -61567595 C2
 SET -80800509 C2 STE -95049515 C2 EST -15000707 00 RPM -54238333 C5 RPT -54238333 C5 SPN -10339168 C0
 GCE -10419051 C3 CCT -28057307 C3 SIP -11657735 C3 CPT -75205029 C2 SIN -77368744 C2 C1 -96180665 C0
 REP -35329261 C6 VEP -94624037 00 CPE -10286629 C3 CPS -53150789 C2 D2 -47096715 C0 C3 -16655086 C1

ECLIPIC COORDINATES

2 DAYS 6 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437958.83333333

OCT. 21, 1962 CE CC CO.000

GEOCENTRIC

X -24569535 C6 Y -24955674 C6 Z -10809615 C6 DX -68217596 CC DY -50934372 C0 DZ -36155659 C0
 R -36650997 C6 DEC -17153562 C2 RA -13455329 C3 V -92494228 CC PTH -79951561 C2 AZ -52934308 C2
 R -36650997 C6 LAT -17153562 C2 LON -34526613 C3 VE -25425208 C2 PTE -20528253 C1 AZE -27021934 C3
 XS -13214825 C9 YS -62973178 C8 ZS -27306705 C8 DXS -14207634 C2 DYS -24162351 C2 DZS -10476357 C2
 XM -24640776 C6 YM -28301564 C6 ZM -12491264 C6 CDM -80309559 CC DYM -55867235 C0 DZM -14740975 C0
 XT -24640776 C6 YT -28301564 C6 ZT -12491264 C6 DXT -80309559 CC DYT -55867235 C0 DZT -14740975 C0
 RS -14891084 C9 VS -29923932 C2 RM -34549577 C6 VM -98934672 CC RT -39549977 C6 VT -98934672 C0
 GED -17263534 C2 ALT -36013365 C6 LOS -56192243 C2 RAS -20547540 C3 RAM -13104408 C3 LCM -34175692 C3
 CLT -34000000 C2 DT -24000000 C4 DR -91075423 CC SHA -35459929 C6 DES -10566477 C2 DEM -18411224 C2

EQUATORIAL COORDINATES

HELIOCENTRIC

X -13190255 C9 Y -68910706 C8 Z -98249999 C2 DX -14889810 C2 CY -26947139 C2 DZ -12804592 C0
 R -14881858 C9 LAT -37826663 C4 LON -27584207 C2 V -30787516 C2 PTH -13388989 C1 AZ -89761635 C2
 XE -13214825 C9 YE -68638744 C8 ZE -97499595 C2 CXE -14207634 C2 DYE -26335999 C2 DZE -10337830 C2
 XT -13190184 C9 YT -68948098 C8 ZT -20177500 C4 DXT -15010730 C2 DYT -25764796 C2 DZT -85981606 C1
 LTE -37514652 C5 LCE -27447685 C2 LTT -77675512 C3 LOT -27597091 C2 RST -14883526 C9 VST -29818687 C2
 EPS -10451102 C3 ESP -13651568 C0 SEP -75352459 C2 EPM -13888568 C3 MEP -37540060 C2 MEP -35702625 C1
 MFS -11644715 C3 MSP -13988227 C1 SMP -63539935 C2 SEM -78909586 C3 EMS -10094100 C3 ESM -14951711 C0
 EPT -13888568 C3 ETP -37540060 C2 TEP -35702625 C1 TPS -11644715 C3 TSP -13988227 C1 STP -63539935 C2
 SET -78909586 C2 STE -10094100 C3 EST -14951711 CC RPM -37457540 C5 RPT -37457540 C5 SPN -10351391 C3
 GCE -10383188 C3 CCT -28019734 C3 SIP -11778772 C3 CPT -75452190 C2 SIN -76792758 C2 C1 -13934769 C1
 REP -36650998 C6 VEP -92494228 00 CPE -10254119 C3 CPS -53190866 C2 D2 -64710830 C0 C3 -32214851 C1

ECLIPIC COORDINATES

2 DAYS 10 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437959.00000000

OCT. 21, 1962 12 CC CO.000

9

SPACE TRAJECTORIES

CASE 1

RA-5 PCSTMIDCOURSE ORBIT

GEOCENTRIC

X	-25534162	C6	Y	.25715857	06	Z	.11345390	06	DX	-.66079775	CC	DY	.56362491	00	DZ	.39161950	CC
R	.37973893	C6	DEC	.17383630	C2	RA	.13479687	C3	V	.95272859	CC	PTH	.81812717	02	AZ	.31941540	C2
R	.37973693	C6	LAT	.17383630	C2	LCN	.28534545	C3	VE	.26371570	C2	PTE	.20492702	C1	AZE	.27025030	C3
XS	-.13194310	C9	YS	-.63320869	08	ZS	-.27457458	C8	DXS	.14284353	C2	DYS	-.24126354	C2	DZS	-.10460648	02
XM	-.25780333	C6	YM	.27478396	06	ZM	.12270542	C6	DXM	-.77946428	CC	DYM	-.58501615	C0	DZM	-.15910346	CC
XT	-.25780333	C6	YT	.27478396	C6	ZT	.12270542	C6	DXT	-.77946428	CC	DYT	-.58501615	CC	DZT	-.15910346	CC
RS	.14890408	09	VS	.29925722	02	RM	.39626430	C6	VM	.98748285	CC	RT	.39626430	C6	VT	.98748285	CC
GED	.17494891	C2	ALT	.37336265	C6	LOS	.35618540	C3	RAS	.20563683	C3	RAM	.13317384	03	LOM	.28372242	C3
DUT	.34000000	C2	DT	.48000000	C3	DR	.94301866	CC	SHA	-.36740501	C6	DES	-.10625975	02	DEM	.18038469	C2

EQUATORIAL COORDINATES

HELIOCENTRIC

ECLIPTIC COORDINATES

X	.13168776	C9	Y	.65298778	C8	Z	.17787500	C4	DX	-.14545151	C2	DY	.26969404	C2	DZ	.13403547	CC
R	.14880855	09	LAT	.68487234	-03	LCN	.27754938	02	V	.30833817	C2	PTH	-.12381630	01	AZ	.89750859	02
XE	.13194310	C9	YE	.65017711	C8	ZE	-.45000000	C1	DXE	-.14284353	C2	DYE	.26296503	C2	DZE	-.10310411	-02
XT	.13168530	C9	YT	.69318629	08	ZT	.32547500	C4	DXT	-.15063818	C2	DYT	.25696479	C2	DZT	.85736273	-01
LTE	-.17315240	-05	LCE	.27613476	C2	LTT	.12531173	-02	LCT	.27762143	C2	RST	.14881562	C9	VST	.29786490	02
EPS	.10449509	03	ESP	.14110097	C0	SEP	.75359447	02	EPM	.14462847	C3	EMP	.33692480	C2	MEP	.16790261	01
MPS	.11062726	C3	MSP	.27453512	-18	SMP	.69365505	C2	SEM	.77026554	C2	EMS	.10282473	03	ESM	.14853236	CC
EPT	.14462847	03	ETP	.33692480	C2	TEP	.16790261	C1	TPS	.11062726	C3	TSP	.27453512	-18	STP	.69365505	C2
SET	.77026594	02	STE	.10282473	03	EST	.14853236	CC	RPM	.20057534	C5	RPT	.20057534	C5	SPN	.10353672	C3
GCE	.10352703	03	GCT	.27929582	C3	SIP	.10565631	C3	CPT	.80166100	C2	SIN	.75195225	C2	D1	.26093363	C1
REP	.37973693	C6	VEP	.95272859	00	CPE	.10223865	C3	CPS	.93230917	C2	D2	.59692766	CC	D3	.85462581	-01

SELENOCENTRIC

EQUATORIAL COORDINATES

X	.24617098	C4	Y	-.17625384	C5	Z	-.52515140	C4	DX	.11866652	CC	DY	.11486411	C1	DZ	.55072296	00
R	.20057534	C5	DEC	-.27467722	02	RA	.27795098	C3	V	.12793558	C1	PTH	-.77455280	02	AZ	.95887709	02
R	.20057532	C5	LAT	-.35432553	01	LCN	.33319562	C3	VR	.12690395	C1	PTR	-.79757036	02	AZR	.10288946	C3
LTS	.15317211	C1	LNS	.26398060	03	LTE	-.67188314	CC	LNE	.67524758	C1	DP	.79377910	-03	ASD	.49709553	C1
ALT	.18319534	C5	SHA	-.18770794	C5	ALP	.15908084	01	DR	-.12488144	C1						
HGE	.25550091	C3	SVL	-.39595110	C1	HNG	.11067888	03	SIA	.13965751	C3						

2 DAYS 10 HRS. 33 MIN. 52.000 SEC.

JULIAN DATE 2437959.02083333

OCT. 21, 1962 12 30 CO.000

GEOCENTRIC

EQUATORIAL COORDINATES

X	-.25653083	C6	Y	.25818874	C6	Z	.11416732	06	DX	-.66080198	CC	DY	.58185001	CC	DZ	.40153546	CC
R	.38144543	C6	DEC	.17415486	C2	RA	.13481545	03	V	.96769759	CC	PTH	.82055848	C2	AZ	.26013437	C2
R	.38144543	C6	LAT	.17415486	C2	LCN	.27784350	C3	VE	.26499554	C2	PTE	.20726687	C1	AZE	.27026004	C3
XS	-.13191738	09	YS	-.63364294	08	ZS	-.27476286	C8	DXS	.14293936	C2	DYS	-.24121809	C2	DZS	-.10458677	02
XM	-.25920365	06	YM	.27372802	C6	ZM	.12241773	06	DXM	-.77644644	CC	DYM	-.58824432	CC	DZM	-.16054597	CC
XT	-.25920365	C6	YT	.27372802	06	ZT	.12241773	C6	DXT	-.77644644	CC	DYT	-.58824432	CC	DZT	-.16054597	CC
RS	.14890324	09	VS	.29925945	02	RM	.39635800	C6	VM	.98725653	CC	RT	.39635800	06	VT	.98725653	CC
GED	.17526525	02	ALT	.37507315	06	LOS	.34868456	03	RAS	.20565651	C3	RAM	.13343886	C3	LOM	.27646691	C3
DUT	.34000000	C2	DT	.24000000	C3	DR	.95841125	00	SHA	-.36908529	C6	DES	-.10633407	02	DEM	.17990329	02

1C

SPACE TRAJECTORIES

CASE 1

RA-5 PCSTMICCLURSE OREIT

HELICENTRIC

ECLIPTIC CCCRINATES

X	-1316605	C9	Y	.65347238	C8	Z	.20215000	C4	DX	-.14954738	C2	DY	-.26985117	O2	DZ	.13588262	CC
R	-14880737	C9	LAT	.77834462	-03	LCN	.27776309	C2	V	.30852215	C2	PTH	-.12182206	O1	AZ	.89747576	C2
XE	.13191738	C9	YE	.65065041	C8	ZE	-.62500000	C1	DXE	-.14293936	C2	DYE	.26291550	C2	DZE	-.10305643	-02
XT	.13165818	C9	YT	.65364877	C8	ZT	.34090000	C4	DXT	-.15070383	C2	DYT	.25687590	C2	DZT	.85697531	-01
LTE	-.24049081	-05	LCE	.27634200	C2	LTT	.13 25269	-02	LCT	.27782763	C2	RST	.14881318	C9	VST	.29782488	C2
EPS	.10448575	C3	ESP	.14196504	C0	SEP	.75372132	C2	EPH	.14618239	C3	EMP	.32285755	C2	MEP	.14318162	C1
MPS	.10505111	C3	ASP	.27453512	-18	SMP	.70942406	O2	SEM	.76791760	C2	EMS	.10305967	C3	ESM	.14853236	00
EPT	.14618239	C3	ETP	.32385755	C2	TEP	.14318162	C1	TPE	.10905111	C3	TSP	.27453512	-18	STP	.70942406	O2
SET	.76791760	C2	STE	.10305967	C3	EST	.14853236	CC	RPM	.17795574	C5	RPT	.17795574	O5	SPN	.10352770	C3
GCE	.10348514	C3	GCT	.27907311	O3	SIP	.10344640	C3	CPT	.80372334	C2	SIN	.74767621	C2	CI	.29440162	C1
REP	.38144543	C6	VEP	.96769799	CO	CPE	.10220240	C3	CPS	.93235926	C2	D2	.10533974	C1	C3	.99803861	-01

SELENCENTRIC

EQUATORIAL CCCRINATES

X	.26728188	C4	Y	-.15539281	C5	Z	-.82504097	C4	DX	.11564446	CC	DY	.11700943	C1	DZ	.56208143	CC
R	.17795574	C5	DEC	-.27621041	C2	RA	.27975960	C3	V	.13032382	C1	PTH	-.76079403	C2	AZ	.95035310	C2
R	.17795571	C5	LAT	-.38334001	C1	LON	.33450895	C3	VR	.12928647	C1	PTR	-.78074721	O2	AZR	.10213564	O3
LTS	.15318885	C1	LNS	.26372672	C3	LTE	-.70118807	CC	LNE	.67728858	C1						
ALT	.16057574	C5	SMA	-.16820213	O5	ALP	.15466003	C1	DR	-.12645622	C1	DP	.10094582	-02	ASC	.56047123	C1
HGE	.25551424	C3	SVL	-.41737125	C1	HNG	.10910374	C3	SIA	.14057768	C3						

2 DAYS 11 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437959.0416666

OCT. 21, 1962 13 CC CO.000

GECCENTRIC

EQUATORIAL CCCRINATES

X	-.25772171	O6	Y	.25925690	O6	Z	.11450148	C6	DX	-.66283103	CC	DY	.60624772	CC	DZ	.41485781	CC
R	.38319312	C6	DEC	.17448753	C2	RA	.13482986	C3	V	.98545513	CC	PTH	.82231008	C2	AZ	.18605884	O2
R	.38319313	C6	LAT	.17448753	C2	LON	.27033737	O3	VE	.26632783	C2	PTE	.21095765	C1	AZE	.27027289	O3
XS	-.13189164	C9	YS	-.63407712	C8	ZS	-.27495111	C8	DXS	.14303518	C2	DYS	-.24117261	O2	DZS	-.10456706	C2
XM	-.26059854	O6	YM	.27266628	O6	ZM	.12212745	C6	DXM	-.77341463	CC	DYM	-.59145796	CC	DZM	-.16198415	00
XT	-.26059854	C6	YT	.27266628	C6	ZT	.12212745	O6	DXT	-.77341463	CC	DYT	-.59145796	CC	DZT	-.16198415	00
RS	.14890240	C9	VS	.29926165	C2	RM	.39645127	O6	VM	.98703169	CC	RT	.39645127	O6	VT	.98703169	CC
GEC	.17560377	C2	ALT	.37681686	C6	LOS	.34118371	C3	RAS	.20567620	C3	RAM	.13370362	O3	LCM	.26921113	C3
DLT	.34000000	C2	DT	.24000000	O3	CR	.98037308	CC	SFA	-.37080102	C6	DES	-.10640839	C2	DEM	.17941850	O2

HELICENTRIC

ECLIPTIC CCCRINATES

X	.13163392	C9	Y	.65395533	C8	Z	.22682500	O4	DX	-.14966349	C2	DY	.27007859	C2	DZ	.13843644	CC
R	.14880019	C9	LAT	.87335845	-03	LON	.27797696	C2	V	.30877746	C2	PTH	-.11552225	C1	AZ	.89743046	C2
XE	.13189164	C9	YE	.65112364	C8	ZE	-.82500000	C1	DXE	-.14303518	C2	DYE	.26286592	C2	DZE	-.10300875	-02
XT	.13163104	C9	YT	.69411111	O8	ZT	.35630000	O4	DXT	-.15076932	C2	DYT	.25679512	C2	DZT	.85657118	-01
LTE	-.31744967	-05	LCE	.27654527	O2	LTT	.13718423	-02	LCT	.27803382	C2	RST	.14881073	C9	VST	.29778491	C2
EPS	.10446818	O3	ESP	.14248096	00	SEP	.75389046	C2	EPH	.14819429	C3	EMP	.30624883	O2	MEP	.11808046	O1
MPS	.10700334	O3	MSP	.27453512	-18	SMP	.72990549	O2	SEM	.76570044	C2	EMS	.10329449	C3	ESM	.14803752	CO
EPT	.14819429	O3	ETP	.30624883	C2	TEP	.11808046	O1	TPE	.10700334	C3	TSP	.27453512	-18	STP	.72990049	O2
SET	.76570044	O2	STE	.10329449	O3	EST	.14803752	CO	RPM	.15501679	C5	RPT	.15501679	O5	SPN	.10351449	O3
GCE	.10345100	O3	GCT	.27879201	O3	SIP	.10056598	C3	CPT	.80649577	C2	SIN	.74212617	O2	CI	.33848479	C1
REP	.38319312	C6	VEP	.98945513	CO	CPE	.10216641	C3	CPS	.93240936	C2	D2	.11020568	O1	D3	.11682651	CO

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SPACE TRAJECTORIES

CASE 1

RA-5 PCST MIDCOURSE ORBIT

SELENOCENTRIC

X .28768223 04 Y -.13409374 05 Z -.72259707 04 DX -.11058359 CC
 R .15501679 05 DEC -.27784101 02 RA .28210858 C3 V .13339667 C1
 R .15501677 05 LAT -.42042444 01 LON .33629232 C3 VR .13236410 C1
 LTS .15320550 01 LNS .26347282 C3 LNE .67531860 C1
 ALT .13763679 05 SHA -.14823613 05 ALP .16678711 01 DR -.12844341 C1
 HGE .25553181 C3 SVL -.44549149 C1 HNG .10705644 C3 SIA .14175693 C3

2 DAYS 11 HRS. 33 MIN. 52.000 SEC.

JULIAN DATE 2437959.C6250000

OCT. 21, 1962 13 30 CO.C00

GEOCENTRIC

X -.25891922 06 Y .26037677 06 Z .11566412 06 DX -.66856442 CC
 R .38498495 06 DEC .17483514 02 RA .13483518 C3 V .10220383 C1
 R .38498496 06 LAT .17483513 02 LON .26282616 C3 VE .26773282 C2
 XS .13186588 06 YS -.62451115 08 ZS -.27513532 08 DXS .14313098 C2
 XM -.26198795 06 YM .27159877 06 ZM .12183459 06 DXM -.77036895 CC
 XT -.26198795 06 YT .27159877 06 ZT .12183459 06 CXT -.77036895 CC
 RS .14890155 09 VS .29926392 02 ZT .36544412 06 VM .56680834 CC
 GED .17595733 02 ALT .37860869 06 LOS .33368286 C3 RAS .20569589 C3
 CLT .34000000 02 DT .24000000 03 DR .10127469 01 SHA -.37257235 C6

HELIOCENTRIC

X .13160696 09 Y .69444576 08 Z .25210000 04 DX -.14981662 C2
 R .14880504 09 LAT .97068384-03 LON .27819104 02 V .30914424 C2
 XE .13186588 09 YE .65159676 08 ZE -.97659999 01 DXE -.14313098 C2
 XT .13160390 09 YT .69457326 08 ZT .37177500 04 DXT -.15083467 C2
 LTE -.37516993-05 LCE .27675652 02 LIT .14314484-02 LCT .27823597 C2
 EPS .10444539 03 ESP .14299503 00 SEP .75411155 02 EPM .15090609 C3
 MPS .10422657 03 MSP .27453512-18 SMP .75768518 02 SEM .76322445 C2
 EPT .15090609 03 ETP .28168662 02 TEP .92524431 00 TPS .10422657 C3
 SET .76322445 02 STE .10352920 03 EST .14820265 00 RPM .13169090 C5
 GCE .10341240 03 GCT .27842276 03 SIP .96642786 02 CPT .81044269 C2
 REP .38458495 06 VEP .10220383 01 CPE .10213057 03 CPS .93245948 C2

SELENOCENTRIC

X .30687270 04 Y -.11221996 05 Z -.61704664 04 DX .10180453 CC
 R .13169090 05 DEC -.27940656 02 RA .28259399 03 V .13751819 C1
 R .13169088 05 LAT -.46964500 01 LON .33880332 C3 VR .13645690 C1
 LTS .15322223 01 LNS .26321893 03 LNE .67333823 C1
 ALT .11431090 05 SHA -.13276493 05 ALP .13246341 01 DR -.13081062 C1
 HGE .25555461 03 SVL -.48362562 01 HNG .10427847 03 SIA .14332231 C3

2 DAYS 12 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437959.C8333333

OCT. 21, 1962 14 00 CO.C00

EQUATORIAL COORDINATES

DY .11977057 C1 DZ .57688197 00
 PTH -.74334340 02 AZ .93930737 02
 PTR -.76019829 C2 AZR .10146401 C3
 DP .13313632-C2 ASD .64373601 01

EQUATORIAL COORDINATES

DY .63998190 00 DZ .43359777 00
 PTH .82268300 02 AZ .95481553 C1
 PTE .21678303 C1 AZE .27029038 C3
 DYS -.24112709 C2 DZS -.10454733 C2
 DYM -.59465703 C0 DZM -.16341798 C0
 DYT -.59465703 C0 DZT -.16341798 C0
 RT .39654412 06 VT .58680834 C0
 RAM .13396811 C3 LOM .26195509 C3
 DES -.10648268 02 DEM .17893034 02

ECLIPTIC COORDINATES

DY .27041287 C2 DZ .14217281 00
 PTH .11686078 01 AZ .89736425 02
 DYE .26281631 02 DZE -.10296106-02
 DYT .25671045 02 DZT .85614800-01
 RST .14880828 C9 VST .29774500 02
 EMP .28168662 C2 MEP .52524431 00
 EMS .10352920 C3 ESM .14820265 C0
 TSP .27453512-18 SIP .75768518 C2
 RPT .13169090 C5 SPN .10349613 03
 SIN .73460490 02 C1 .39942089 C1
 D2 .11161286 01 C3 .13487455 C0

EQUATORIAL COORDINATES

DY .12346389 C1 DZ .59701575 00
 PTH -.72031100 02 AZ .92432382 C2
 PTR -.73403735 C2 AZR .10082346 C3
 DP .18457935-C2 ASD .75837775 01

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SPACE TRAJECTORIES

CASE 1

RA-5 PCSTMI DCOURSE ORBIT

GEOCENTRIC

EQUATORIAL CCORDINATES

X	-26C13296 06	Y	.26156981 C6	Z	.11646773 C6	DX	-.68183403 CC	DY	.68886061 CC	DZ	.46124649 C0
R	.38684965 C6	CEC	.1752171C 02	RA	.13484220 C3	V	.1C733941 C1	PTH	.82071637 C2	AZ	.35911C24 C3
R	.38684965 C6	LAT	.1752171C 02	LON	.25530864 C3	VE	.26924386 C2	PTE	.22629629 C1	AZE	.27031528 C3
XS	-.13184C11 C9	YS	-.63494520 C8	ZS	-.27532749 C8	DXS	.14322677 C2	DYS	-.241C8154 C2	DZS	-.10452758 C2
XH	-.26337186 C6	YH	.27052552 C6	ZH	.12139515 C6	DXH	-.7673C946 CC	DYH	-.5978415C CC	DZH	-.16484743 C0
XT	-.26337186 C6	YT	.27052552 C6	ZT	.12139515 C6	DXT	-.76730946 CC	DYT	-.59784150 C0	DZT	-.16484743 C0
RS	.14890C71 C9	VS	.25926615 C6	RM	.39663655 C6	VM	.9865865C CC	RT	.39663655 C6	VT	.9865865C CC
GEO	.17633741 C2	ALT	.38047341 C2	LCS	.32618202 C3	RAS	.20571557 C3	RAM	.13423234 C3	LCM	.25465878 C3
DLT	.34CCCCC0 C2	DT	.12000CCC C3	DR	.1C631339 C1	SHA	-.37442558 C6	DES	-.10655698 C2	DEM	.17843884 C2

HELIOCENTRIC

ECLIPTIC CCORDINATES

X	.13157998 C9	Y	.65493295 C8	Z	.27812500 C4	DX	-.15004511 C2	DY	.27C92A66 C2	DZ	.14809453 CC
R	.14880393 C9	LAT	.1C708984-C2	LCN	.27840544 C2	V	.3C97CC29 C2	PTH	-.11385259 C1	AZ	.89725942 C2
XE	.13184C11 C9	YE	.69206981 C8	ZE	-.12000CCC C2	DXE	-.14322677 C2	DYE	.26276666 C2	DZE	-.1C290146-C2
XT	.13157674 C9	YT	.69503529 C8	ZT	.38715C00 C4	DXT	-.15089586 C2	DYT	.25662590 C2	DZT	.8557C931-C1
LTE	-.46175C21-C5	LOE	.27696379 C2	LTT	.14906713-C2	LOT	.2784461C C2	RST	.14880584 C9	VST	.29770514 C2
EPS	.10441604 C3	ESP	.1452625 C0	SEP	.75439751 C2	EPH	.15476552 C3	EMP	.24566090 C2	MEP	.664334C6 C0
MPS	.10022586 C3	PSP	.27453512-18	SMP	.7577CC51 C2	SEP	.76C87964 C2	EMS	.10376379 C3	ESH	.1482C265 C0
EPT	.15476952 C3	ETP	.245666C9 C2	TEP	.664334C6 C2	TPS	.1C222586 C3	TSP	.27453512-18	STP	.7977C051 C2
SET	.76C87564 C2	STE	.1C376379 C3	EST	.14820265 CC	RPM	.1C78955C C5	RPT	.1C789550 C5	SPN	.10347136 C3
GCE	.10337296 C3	GCT	.27790884 C3	SIP	.9C956165 C2	CPT	.81647580 C2	SIN	.72377887 C2	C1	.48963952 C1
REP	.38684965 C6	VEP	.1C733941 C1	CPE	.1C259465 C3	CPS	.93250966 C2	D2	.10199183 C1	D3	.14422220 C0

SELENOCENTRIC

EQUATORIAL CCORDINATES

X	.32388566 C4	Y	-.85557C38 C4	Z	-.5C714216 C4	DX	.85475419-C1	DY	.12867021 C1	DZ	.62609392 CC
R	.1C789550 C5	DEC	-.280363C0 C2	RA	.28588290 C3	V	.14334929 C1	PTH	-.68816898 C2	AZ	.50271257 C2
R	.1C789549 C5	LAT	-.53835934 C1	LON	.34253873 C3	VR	.14235530 C1	PTR	-.69874455 C2	AZR	.1C013494 C3
LTS	.15323875 C1	LNS	.262965C5 C3	LTE	-.78894C63 C3	LNE	.67134671 C1				
ALT	.90515504 C4	SHA	-.1C618C28 C5	ALP	.1C484553 C1	DR	-.13366324 C1	DP	.275C6941-C2	ASC	.92696927 C1
HGE	.25558396 C3	SVL	-.53770672 C1	HNG	.1CC27155 C3	SIA	.14549583 C3				

2 DAYS 12 HRS. 33 MIN. 52.000 SEC.

JULIAN DATE 2437959.10416666

CCT. 21,1962 14 30 00.000

GEOCENTRIC

EQUATORIAL CCORDINATES

X	-.26138417 C6	Y	.26287256 C6	Z	.11733446 C6	DX	-.71298518 CC	DY	.76468049 CC	DZ	.50565585 C0
R	.38883292 C6	CEC	.1756338C C2	RA	.13483733 C3	V	.11613689 C1	PTH	.81577776 C2	AZ	.34861277 C3
R	.38883292 C6	LAT	.1756338C C2	LON	.24778324 C3	VE	.27C9CE47 C2	PTE	.243C4750 C1	AZE	.27C35299 C3
XS	-.13181432 C9	YS	-.63537911 C8	ZS	-.27551563 C8	DXS	.14332253 C2	DYS	-.241C3595 C2	DZS	-.10450782 C2
XH	-.26475C25 C6	YH	.26944654 C6	ZH	.12124114 C6	DXH	-.76423623 CC	DYH	-.601C1132 C0	DZH	-.16627248 CC
XT	-.26475C25 C6	YT	.26944654 C6	ZT	.12124114 C6	DXT	-.76423623 CC	DYT	-.601C1132 C0	DZT	-.16627248 CC
RS	.14889586 C9	VS	.25926838 C2	RM	.39672856 C6	VM	.98636614 CC	RT	.39672856 C6	VT	.98636614 CC
GEO	.17675643 C2	ALT	.38245668 C6	LCS	.31868117 C3	RAS	.2C573526 C3	RAM	.13449631 C3	LCM	.24744222 C3
DLT	.34CCCCC0 C2	DT	.12000CCC C3	DR	.11 88442 C1	SHA	-.37640810 C6	DES	-.10663126 C2	DEM	.1779440C C2

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SPACE TRAJECTORIES

CASE 1

RA-5 PCSTWIDCOURSE ORBIT

HELIOCENTRIC

ECLIPTIC COORDINATES

X	.13155294	09	Y	.69542129	08	Z	.30567500	04	DX	-.15045242	02	DY	-.27174427	02	DZ	.15867519	00
R	.1480283	09	LAT	.11769861	-02	LOX	.27862033	02	V	.31061776	02	PTH	-.11092449	01	AZ	.89707232	02
XE	.13181432	09	YE	.69254275	08	ZE	-.13500000	02	DXE	-.14332253	02	DYE	.26271698	02	CZE	-.10285377	-02
XT	.13154957	09	YT	.69549716	08	ZT	.40255000	04	DXT	-.15096490	02	DYT	.25654147	02	DZT	.85525034	-01
LTE	-.51947193	-05	LCE	.27171104	02	LTT	.15499925	-02	LCT	.27865222	02	RST	.14880340	09	VST	.29766534	02
EPS	.10437833	03	ESP	.14503307	00	SEP	.75476732	02	EPH	.16070738	03	EMP	.18893939	02	MEP	.39854255	00
MPS	.93906377	02	MSP	.27453512	-18	SMP	.86090411	02	SEM	.75853598	02	EMS	.10399827	03	ESM	.14803752	00
EPT	.16070738	03	ETP	.18893535	02	TEP	.39854255	00	TSP	.93900377	02	TSP	.27453512	-18	STP	.86090411	02
SET	.75853598	02	STE	.10399827	03	EST	.14803752	00	RPM	.83552303	04	RPT	.83552303	04	SPN	.10343847	03
GCE	.10333187	03	GCT	.27712471	03	SIP	.81900417	02	CPT	.82679588	02	SIN	.70674028	02	C1	.63799578	01
REP	.38883292	06	VEP	.11613689	01	CPE	.10205811	03	CPS	.93255589	02	D2	.53690930	00	C3	.92725186	-01

SELENOCENTRIC

EQUATORIAL COORDINATES

X	.33660844	04	Y	-.65739795	04	Z	-.39066795	04	DX	.51247050	-01	DY	.13656918	01	DZ	.67192833	00
R	.83552303	04	CEC	-.27876864	02	RA	.29711387	03	V	.15229012	01	PTH	-.63939563	02	AZ	.86873429	02
R	.83552293	04	LAT	-.64114609	01	LOX	.34860281	03	VR	.15134379	01	PTR	-.64681985	02	AZR	.59225567	02
LTS	.15325553	01	LNS	.26271113	03	LTE	-.61813542	00	LNE	.66934201	01						
ALT	.66172303	04	SHA	-.83357866	04	ALP	.45563965	00	DR	-.13680696	01	DP	.45879200	-02	ASD	.12005959	02
HGE	.25562166	03	SVL	-.61926788	01	HNG	.93929341	02	SIA	.14870142	03						

2 DAYS 13 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437959.12500000

OCT. 21, 1962 15 00 00.000

GEOCENTRIC

EQUATORIAL COORDINATES

X	-.26273023	06	Y	.26435405	06	Z	.11830943	06	DX	-.75816640	00	DY	.89385722	00	DZ	.58673036	00
R	.39103371	06	CEC	.17611161	02	RA	.13482348	03	V	.13342799	01	PTH	.81062072	02	AZ	.34202373	03
R	.39103371	06	LAT	.17611161	02	LOX	.24024886	03	VE	.27274754	02	PTE	.27699499	01	AZE	.27041470	03
XS	-.13178851	09	YS	-.63581296	08	ZS	-.27570374	08	DXS	.14341829	02	DYS	-.24099033	02	DZS	-.10448804	02
XM	-.26612311	06	YM	.26836188	06	ZM	.12094057	06	DXM	-.76114934	00	DYM	-.60416646	00	DZM	-.16769313	00
XT	-.26612311	06	YT	.26836188	06	ZT	.12094057	06	DXT	-.76114934	00	DYT	-.60416646	00	DZT	-.16769313	00
RS	.14889502	09	VS	.25927060	02	RM	.39682014	06	VM	.98614725	00	RT	.39682014	06	VT	.98614725	00
GED	.17723689	02	ALT	.38465748	06	LOS	.31118033	03	RAS	.20575496	03	RAM	.13476001	03	LOM	.24018538	03
DLT	.34000000	02	DT	.12000000	03	DR	.13180781	01	SHA	-.37861869	06	DES	-.10670553	02	DEM	.17744583	02

HELIOCENTRIC

ECLIPTIC COORDINATES

X	.13152578	09	Y	.69591163	08	Z	.33595000	04	DX	-.15139595	02	DY	.27320223	02	DZ	.18166757	00
R	.14800175	09	LAT	.12935678	-02	LOX	.27883612	02	V	.31235348	02	PTH	-.11101798	01	AZ	.89666672	02
XE	.13178851	09	YE	.69591562	08	ZE	-.16000000	02	DXE	-.14341829	02	DYE	.26266726	02	DZE	-.10279417	-02
XT	.13152239	09	YT	.69595888	08	ZT	.41750000	04	DXT	-.15102578	02	DYT	.25645715	02	DZT	.85477590	-01
LTE	-.61567391	-05	LCE	.27737831	02	LTT	.16091230	-02	LCT	.27885830	02	RST	.14880096	09	VST	.29762559	02
EPS	.10433059	03	ESP	.14553811	00	SEP	.75523621	02	EPH	.17000597	03	EMP	.98005373	01	MEP	.14604142	00
MPS	.82272548	02	MSP	.27453512	-18	SMP	.97725208	02	SEM	.75619348	02	EMS	.10423264	03	ESM	.14770671	00
EPT	.17005297	03	ETP	.98005373	01	TEP	.14604142	00	TSP	.82272548	02	TSP	.27453512	-18	STP	.97725208	02
SET	.75619348	02	STE	.10423264	03	EST	.14770671	00	RPM	.58734272	04	RPT	.58734272	04	SPN	.10339602	03
GCE	.10328123	03	GCT	.27570315	03	SIP	.65060496	02	CPT	.84798198	02	SIN	.67586146	02	D1	.92934676	01
REP	.39103371	06	VEP	.13342799	01	CPE	.10201928	03	CPS	.93261021	02	D2	.16883718	01	C3	.39053930	00

CASE 1

SPACE TRAJECTORIES

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RA-5 PCSTMIDCOURSE DREIT

SELENOCENTRIC

X .33928748 04 Y -.40078208 04 Z -.26311443 C4
 R .58734272 04 DEC -.26613790 C2 RA .37017064-C1
 R .58734264 04 LAT -.26613790 C2 V .16776770 C1
 LNS .15327192 C1 LNS .26245724 C3 LNE .66732924 C1
 ALT .41354272 04 SHA .58201207 C4 ALP .10969114 C1 DR -.13815446 C1
 HGE .25566940 C3 SVL -.75148080 C1 HNG .82205188 C2 SIA .15284091 C3

EQUATORIAL COORDINATES

DY .14980237 C1 DZ .75442349 00
 PTH -.55435359 C2 AZ .80835820 02
 PTR -.55869289 02 AZR .97558618 02
 DP .92849468-C2 ASD .17212052 02

2 DAYS 13 HRS. 33 MIN. 52.000 SEC.

JULIAN DATE 2437959.14583333

OCT. 21, 1962 15 30 CO.000

GEOCENTRIC

X -.26438701 06 Y .26614925 06 Z .11950011 06
 R .39372095 06 DEC .17668828 02 RA .13480968 C3
 R .39372094 C6 LAT .17668828 C2 LON .23271453 C3
 XS -.13176269 C9 YS -.63624671 08 ZS -.27589181 C8
 XM -.26749038 06 YM .26727155 06 ZM .12063745 06
 XT -.26749038 06 YT .26727155 06 ZT .12063745 06
 RS .14885818 C9 VS .25927284 02 RM .39691130 06
 GED .17781676 C2 ALT .38734473 06 LCS .30367949 C3
 DLT .34000000 02 DT .59999999 C2 DR .17359914 C1 SHA -.38130574 C6

EQUATORIAL COORDINATES

DY .11140224 C1 DZ .75748619 00
 PTH .82056595 C2 AZ .24745224 01
 PTE .36322929 C1 AZE .27050704 C3
 DVS -.24094468 C2 DZS -.10446826 02
 DVM -.60730687 C0 DZM -.16910933 00
 DYT -.60730687 00 DZT -.16910933 00
 RT .39691130 06 VT .98592586 C0
 RAM .13502344 C3 LCM .23292829 03
 DES -.10677977 02 DEM .17694437 02

HELIOCENTRIC

X .13149830 C9 Y .69640560 08 Z .37360000 C4
 R .14880057 09 LAT .14385497-C2 RA .15472790 C2
 XE .13176269 C9 YE .69348839 C8 ZE -.17500000 C2
 XT .13149830 C9 YT .69642043 08 ZT .43332500 C4
 LTE -.67339717-05 LOE .27758558 02 LTT .16685443-C2
 EPS .10427591 03 ESP .14670980 C0 SEP .75573262 C2
 MPS .54057864 02 MSP .27453512-18 SMP .12594104 C3
 EPT .15596010 C3 ETP .23834629 02 TEP .20498850 C0
 SET .75385213 02 STE .10446690 03 STP .34903655 C4
 GGE .10323279 03 GGT .27160051 C3 SIP .90622253 C2
 REP .39372095 06 VEP .17528095 C1 CPE .10197132 C3 CPS .93266070 C2

ECLIPTIC COORDINATES

DY .27585172 02 DZ .25074065 C0
 PTH -.13830587 C1 AZ .89545617 02
 DVE .26261751 02 DZE -.10274649-02
 DYT .25637295 02 DZT .85427998-C1
 RST .14879852 C9 VST .29158590 C2
 EMP .23834629 C2 MEP .20498850 C0
 ENS .10446690 C3 ESM .14770671 00
 TSP .27453512-18 STP .12594104 C3
 RPT .34903655 C4 SPN .10335172 C3
 SIN .60760473 C2 D1 .17224341 02
 C2 .14688999 C2 D3 .71694348 01

SELENOCENTRIC

X .31033774 04 Y -.11222296 04 Z -.11373390 C4
 R .34905649 C4 DEC -.19016006 02 RA .34011807 C3
 R .34905649 C4 LAT -.10647152 02 LON .28532108 C2
 LNS .15328865 C1 LNS .26220334 C3 LNE .66530451 C1
 ALT .17525655 04 SHA .28260365 04 ALP .72315156 C1
 HGE .25512008 03 SVL -.93950958 01 HNG .53491040 C2 SIA .12609804 C3

EQUATORIAL COORDINATES

DY .17213293 C1 DZ .92655552 C0
 PTH -.36345215 02 AZ .68999417 02
 PTR -.36501597 02 AZR .92669034 02
 DP .26288505-01 ASD .29862060 02

2 DAYS 13 HRS. 57 MIN. 35.304 SEC.

JULIAN DATE 2437959.16230676

OCT. 21, 1962 15 53 43.304

CASE 1

EQUATORIAL COORDINATES

HELIOCENTRIC

SELENOCENTRIC

SELENOCENTRIC

2 DAYS 14 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437959.16666666

OCT. 21, 1962 16 00 00.000

CASE 1

SPACE TRAJECTORIES

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RA-5 POSTMIDCOURSE ORBIT

GEOCENTRIC

X	-26729679	06	Y	-26809706	06	Z	-12100142	06	DX	-21744387	C1	DY	-80820910	00	DZ	-80153038	00
R	-39744804	06	DEC	-17724828	02	RA	-13491436	03	V	-24543505	C1	PTH	-66546354	02	AZ	-82835557	02
R	-39744803	06	LAT	-17724830	02	LON	-22529867	03	VE	-26732609	C2	PTE	-48315127	01	AZE	-27026204	03
XS	-13173684	09	YS	-63668038	08	ZS	-27607983	08	DXS	-14360975	C2	DYS	-24089899	02	DZS	-10444845	02
XM	-26885208	06	YM	-26617558	06	ZM	-12033178	06	DXM	-75493491	C0	DYM	-61043253	00	DZM	-17052109	00
XT	-26885208	06	YT	-26617558	06	ZT	-12033178	06	DXT	-75493491	CC	DYT	-61043253	00	DZT	-17052109	00
RS	-14889733	09	VS	-25927506	02	RM	-39702023	06	VM	-98571396	CC	RT	-39702023	06	VT	-98571396	00
GED	-17837589	02	ALT	-39107184	06	LDS	-29617865	03	RAS	-20579434	C3	RAM	-13528662	03	LQM	-22567093	03
DLT	-34000000	02	DT	-59999999	02	DR	-22515780	01	SHA	-38481305	C6	DES	-10685401	02	DEM	-17643961	02

EQUATORIAL CCORDINATES

HELIOCENTRIC

X	-13146955	09	Y	-69690213	08	Z	-43367500	04	DX	-16535413	C2	DY	-27317144	02	CZ	-41281235	00
R	-14879841	09	LAT	-16698932	-02	LON	-27927450	02	V	-31934568	C2	PTH	-32593039	C1	AZ	-89258032	02
XE	-13173684	09	YE	-69396106	08	ZE	-19500000	02	DXE	-14360975	C2	DYE	-26256771	02	DZE	-10265112	-02
XT	-13146799	09	YT	-69688185	08	ZT	-44867500	04	DXT	-15115510	C2	DYT	-25628886	02	DZT	-85377096	-01
LTE	-75036108	-05	LOE	-27779284	02	LTT	-17276786	-02	LDT	-27527040	C2	RST	-14879609	09	VST	-29754627	02
EPS	-10433761	03	ESP	-14820265	00	SEP	-75514210	02	EPM	-79789184	C2	EMP	-99847038	02	MEP	-36369451	00
MPS	-24819469	02	MSP	-27453512	-18	SMP	-15518011	03	SEM	-75151189	C2	EMS	-10470104	03	ESM	-14770671	00
EPT	-79789184	02	ETP	-95847038	02	TEP	-36369451	C2	TPS	-24819469	C2	TSP	-27453512	-18	STP	-15518011	03
SET	-75151189	02	STE	-10470104	03	EST	-14770671	CC	RPM	-25611447	04	RPT	-25611447	04	SPN	-10341813	03
GCE	-10314699	03	GCT	-11182300	03	SIP	-17915084	02	CPT	-10198045	C3	SIN	-59245896	02	D1	-27716725	02
REP	-39744804	06	VEP	-24543505	01	CPE	-10188081	03	CPS	-93271110	C2	D2	-25837627	02	D3	-55368635	02

ECLIPTIC CCORDINATES

SELENCENTRIC

X	-15552525	04	Y	-19214861	04	Z	-66964041	03	DX	-14195038	C1	DY	-14186416	01	DZ	-97205146	00
R	-25611447	04	DEC	-15156792	02	RA	-51012538	02	V	-22298922	C1	PTH	-11812186	02	AZ	-66124608	02
R	-25611442	04	LAT	-48119527	01	LON	-10659354	03	VR	-22233401	C1	PTR	-11847499	02	AZR	-80099692	02
LTS	-15330522	01	LNS	-26194943	03	LTE	-90554647	CC	LNE	-6326797	C1	DP	-48828897	-01	ASD	-42734557	02
ALT	-82314468	03	SHA	-10750844	04	ALP	-17270457	03	DR	-45646837	CC	DP	-48828897	-01	ASD	-42734557	02
HGE	-25566238	03	SVL	-36303702	01	HNG	-33543082	03	SIA	-37054628	C2	DP	-48828897	-01	ASD	-42734557	02

EQUATORIAL CCORDINATES

2 DAYS 14 HRS. 33 MIN. 52.000 SEC.

JULIAN DATE 2437959.18750000

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GEOCENTRIC

X	-27147336	06	Y	-26878888	06	Z	-12211290	06	DX	-23179320	C1	DY	-84582669	-01	DZ	-46799388	00
R	-40106957	06	DEC	-17726166	02	RA	-13528469	03	V	-23662309	C1	PTH	-48308865	02	AZ	-92695379	02
R	-40106956	06	LAT	-17726167	02	LON	-21814847	03	VE	-26346551	C2	PTE	-38485469	01	AZE	-26983885	03
XS	-13171099	09	YS	-63711397	08	ZS	-27626783	08	DXS	-14370545	C2	DYS	-24085328	02	DZS	-10442864	02
XM	-27020815	06	YM	-26507400	06	ZM	-12002358	06	DXM	-75180751	CC	DYM	-61354339	00	DZM	-17192837	00
XT	-27020815	06	YT	-26507400	06	ZT	-12002358	06	DXT	-75180751	CC	DYT	-61354339	00	DZT	-17192837	00
RS	-14889649	09	VS	-25927729	02	RM	-39702234	06	VM	-98549956	CC	RT	-39702234	06	VT	-98549956	CC
GED	-17839333	02	ALT	-35469337	06	LCS	-28867781	03	RAS	-20581403	C3	RAM	-13554953	03	LQM	-21841331	03
DLT	-34000000	02	DT	-59999999	02	DR	-17683895	01	SHA	-38775838	C6	DES	-10692824	02	DEM	-17593158	02

EQUATORIAL CCORDINATES

CASE 1

RA-5 PCSTWIDCOURSE ORBIT

SPACE TRAJECTORIES

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HELIOCENTRIC

ECLIPTIC CCOORDINATES

X	.13143951	C9	Y	.69738548	O8	Z	.50794999	O4	DX	-.16688477	C2	DY	.26515939	O2	DZ	.39452982	O0
R	.14879452	C9	LAT	.15559445	-O2	LON	.27949311	C2	V	.31332585	C2	PTH	-.42356230	O1	AZ	.89276420	C2
XE	.13171099	O9	YE	.69443365	O8	ZE	-.21250000	C2	DXE	-.14370545	O2	DYE	.26251788	C2	DZE	-.10261536	-O2
XT	.13144078	O9	YT	.69734309	O8	ZT	.46405000	O4	DXT	-.15122533	C2	DYT	.25620490	C2	DZT	.65324048	-O1
LTE	-.81770582	-O5	LOE	.27800011	O2	LTT	.17869112	-O2	LCT	.27947641	C2	RST	.14879365	O9	VST	.29750669	O2
EPS	.10465351	C3	ESP	.14951711	O0	SEP	.75197170	C2	EPM	.26403508	C2	EMP	.15331122	O3	MEP	.28504796	O0
MPS	.78723632	C2	MSP	.27453512	-18	SMP	.10127469	C3	SEM	.74917280	C2	EMS	.10493350	O3	ESM	.14770671	C0
EPT	.26403508	O2	ETP	.15331122	O3	TEP	.28504796	O0	TPS	.78723632	C2	TSP	.27453512	-18	STP	.10127469	O3
SET	.74917280	C2	STE	.10493508	C3	EST	.14770671	O0	RPM	.44459388	C4	RPT	.44459388	C4	SPN	.10374233	C3
GCE	.10304068	C3	GCT	.98016593	C2	SIP	.55711965	O2	CPT	.98490744	C2	SIN	.75483077	O2	D1	.12741454	C2
REP	.40106957	O6	VEP	.23662309	O1	CPE	.10174113	C3	CPS	.93276045	C2	D2	.37184443	O1	C3	.10788361	O1

SELENOCENTRIC

EQUATORIAL CCOORDINATES

X	-.12652081	C4	Y	.37148834	O4	Z	.20893210	O4	CX	-.15661244	C1	DY	.69852606	O0	DZ	.63992225	O0
R	.44459388	O4	CEC	.28030352	O2	RA	.10880772	C3	V	.18303510	C1	PTH	.46608445	C2	AZ	.89232405	C2
R	.44459381	O4	LAT	.52274843	O1	LON	.16022589	C3	VR	.18222385	O1	PTR	.46873893	O2	AZR	.80251984	O2
LTS	.15332178	O1	LNS	.26169552	C3	LTE	-.93466225	O0	LNE	.66122258	C1	DP	.16204583	-O1	ASC	.23011667	C2
ALT	.27079388	C4	SHA	.43601372	O4	ALP	.17886842	C3	DR	.13300721	C1						
HGE	.25534648	C3	SVL	.49268638	O1	HNG	.28131874	C3	SIA	.33518417	C1						

2 DAYS 15 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437959.20833333

OCI. 21, 1962 17 CC CO.000

GEOCENTRIC

EQUATORIAL CCOORDINATES

X	-.27552655	C6	Y	.26870490	C6	Z	.12281552	O6	CX	-.21902578	C1	DY	-.13876777	O0	DZ	.33328135	O0
R	.40398126	O6	CEC	.17698786	C2	RA	.13571813	C3	V	.22198508	C1	PTH	.42610605	O2	AZ	.94555171	O2
R	.40398125	O6	LAT	.17698786	O2	LON	.21106138	C3	VE	.26478846	O2	PTE	.32536981	O1	AZE	.26971878	O3
XS	-.13168511	C9	YS	-.63754745	O8	ZS	-.27645579	O8	DXS	.14380115	C2	DYS	-.24080752	O2	DZS	-.10440880	O2
XM	-.27155858	O6	YM	.26396681	O6	ZM	.11971284	O6	CXM	-.74866674	CC	DYM	-.61663945	O0	DZM	-.17333116	O0
XT	-.27155858	O6	YT	.26396681	O6	ZT	.11971284	O6	DM	-.74866674	CC	DYT	-.61663945	O0	DZT	-.17333116	O0
RS	.14889565	O9	VS	.29927952	O2	RM	.39718221	O6	VM	.98528665	CC	RT	.39718221	O6	VT	.98528665	O0
GED	.17811801	O2	ALT	.39760505	O6	LOS	.28117698	O3	RAS	.20583373	C3	RAM	.13581218	O3	LOM	.21115543	O3
DLT	.34000000	C2	DT	.12000000	O3	DR	.15028661	C1	SHA	-.36587543	O6	DES	-.10700247	O2	DEM	.17542029	O2

HELIOCENTRIC

ECLIPTIC CCOORDINATES

X	.13140958	O9	Y	.69786002	O8	Z	.57552499	O4	DX	-.16570413	O2	DY	.26252078	O2	DZ	.35995233	O0
R	.14879034	C9	LAT	.22162160	-O2	LON	.27970855	C2	V	.31046412	C2	PTH	-.42891060	O1	AZ	.89333665	O2
XE	.13168511	O9	YE	.69490618	O8	ZE	-.23500000	O2	DXE	-.14380115	O2	DYE	.26246801	O2	DZE	-.10255575	-O2
XT	.13141355	O9	YT	.69780421	O8	ZT	.47937500	O4	DXT	-.15128782	O2	DYT	.25612104	O2	DZT	.85265212	-O1
LTE	-.90429156	-O5	LCE	.27820740	O2	LTT	.18459532	-O2	LCT	.27968241	O2	RST	.14879122	O9	VST	.29746717	O2
EPS	.10503533	O3	ESP	.14984393	O0	SEP	.74814539	O2	EPM	.10429030	C2	EMP	.16939039	O3	MEP	.18036143	O0
MPS	.97366505	O2	MSP	.27453512	-18	SMP	.82630850	C2	SEM	.74683481	O2	EMS	.10516900	O3	ESM	.14720910	O0
EPT	.10429030	O2	ETP	.16939039	O3	TEP	.18036143	O0	TPS	.97366505	O2	TSP	.27453512	-18	STP	.82630850	O2
SET	.74683481	O2	STE	.10516900	O3	EST	.14720910	O0	RPM	.69152626	O4	RPT	.69152626	O4	SPN	.10413071	O3
GCE	.10294392	O3	GCT	.95732673	O2	SIP	.82810389	O2	CPT	.95253494	O2	SIN	.80697377	O2	D1	.77898840	C1
REP	.40398126	O6	VEP	.22198508	O1	CPE	.10160291	O3	CPS	.93280529	O2	D2	.12881459	O1	D3	.26160105	O0

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SPACE TRAJECTORIES

CASE 1

RA-5 PCSTMIDCOURSE ORBIT

SELENOCENTRIC

X	-39679710	04	Y	.47380871	04	Z	.31026752	04	DX	-14416311	C1	DY	.47787168	CC	DZ	.50661255	00
R	.69152626	04	DEC	.26658426	02	RA	.12994492	03	V	.16010365	C1	PTH	.59671726	02	AZ	.59031571	02
R	.69152614	04	LAT	.80528458	01	LON	.17866846	03	VR	.15919878	C1	PTR	.60233091	02	AZR	.82356151	02
LTS	.15333834	C1	LNS	.26144161	03	LTE	.96366967	CC	LNE	.65916592	C1						
ALT	.51772625	04	SHA	.68581449	04	ALP	.17895751	03	DR	.13819290	C1	DP	.66983313	-02	ASD	.14556116	02
HGE	.25498466	03	SVL	.71514180	C1	HNG	.26257541	03	SIA	-.41270861	C1						

2 DAYS 15 HRS. 33 MIN. 52.000 SEC.

JULIAN DATE 2437959.22916666

OCT. 21, 1962 17 30 00.000

GEOCENTRIC

EQUATORIAL CCORDINATES

X	-27938342	06	Y	.26836462	06	Z	.12335494	06	DX	-21012034	01	DY	-.22833979	00	DZ	.27269104	00
R	.40656008	06	DEC	.17662610	02	RA	.13615243	03	V	.21310524	C1	PTH	.40214306	02	AZ	.95357449	02
R	.40656007	06	LAT	.17662611	02	LON	.20397515	03	VE	.26664556	C2	PTE	.29578279	C1	AZE	.26967306	03
XS	-.13165922	09	YS	-.63798089	08	ZS	-.27664372	08	DXS	.14389682	C2	DYS	-.24076173	C2	DZS	-.10438896	02
XM	-.27290335	06	YM	.26285409	06	ZM	.11939958	06	DXM	.14389682	C2	CYM	-.61972063	00	DZM	-.17472944	00
XT	-.27290335	06	YT	.26285409	06	ZT	.11939958	06	DXT	-.74551269	CC	DYT	-.61972063	00	DZT	-.17472944	00
RS	.14889480	09	VS	.29928174	02	RM	.39727166	06	VM	.98507523	C0	RT	.39727166	06	VT	.98507523	00
GEO	.17775425	02	ALT	.40018386	06	LOS	.27367613	03	RAS	.20585342	C3	RAM	.13607457	C3	LOM	.20389729	03
DLT	.34000000	02	DT	.12000000	03	DR	.13759364	01	SHA	-.39163826	C6	DES	-.10707667	02	DEM	.17490576	02

HELICENTRIC

ECLIPTIC CCORDINATES

X	.13137583	09	Y	.698333145	08	Z	.63845000	04	DX	-.16490886	C2	DY	.26140804	02	DZ	.33955872	00
R	.14878618	09	LAT	.24585945	-02	LON	.27992262	02	V	.30909651	C2	PTH	-.42531647	C1	AZ	.89367824	02
XE	.13165922	09	YE	.69537857	08	ZE	-.24250000	02	DXE	-.14389682	C2	DYE	.26241811	02	DZE	-.10247230	-02
XT	.13138631	09	YT	.69826517	08	ZT	.45480000	04	DXT	-.15135195	C2	DYT	.25603730	02	DZT	.85213184	-01
LTE	-.93315721	-05	LCE	.27841467	02	LTT	.19053821	-02	LOT	.27988837	C2	RST	.14878879	09	VST	.29742770	02
EPS	.10542043	03	ESP	.15065786	00	SEP	.74428753	02	EPH	.79601622	C1	EMP	.17185247	03	MEP	.18728045	00
MPS	.10615711	03	MSP	.27453512	-18	SMP	.73839414	02	SEM	.74449157	C2	EMS	.10540282	03	ESM	.14720910	00
EPT	.79601622	C1	ETP	.17185247	03	TEP	.18728045	CC	TPS	.10615711	C3	TSP	.27453512	-18	STP	.73839414	C2
SET	.74449197	02	STE	.10540282	03	EST	.14720910	CC	RPM	.93809357	C4	RPT	.93809357	C4	SPN	.10452155	03
GCE	.10285433	03	GCT	.94616967	02	SIP	.55480275	02	CPT	.93510878	C2	SIN	.82834040	02	C1	.56559589	01
REP	.40656008	06	VEP	.21310924	C1	CPE	.10147095	03	CPS	.93285797	C2	D2	.18818568	01	D3	.30900630	00

SELENOCENTRIC

EQUATORIAL CCORDINATES

X	-.64800642	04	Y	.55105285	04	Z	.39553506	04	DX	-.13556907	C1	DY	.39138084	00	DZ	.44742047	00
R	.93809357	04	DEC	.24937988	02	RA	.13962276	03	V	.14802909	C1	PTH	.66259187	02	AZ	.10325518	03
R	.93809347	04	LAT	.91069233	C1	LON	.18731027	03	VR	.14705933	C1	PTR	.67133425	02	AZR	.83600229	02
LTS	.15335482	C1	LNS	.26118768	03	LTE	-.99268432	CC	LNE	.65709740	C1						
ALT	.76429357	04	SHA	-.90102515	04	ALP	.17742414	C3	DR	.13550229	C1	DP	.36399645	-02	ASD	.10676838	02
HGE	.25457956	03	SVL	.75098806	C1	HNG	.25368337	03	SIA	-.27166758	C1						

2 DAYS 16 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437959.25000000

OCT. 21, 1962 18 00 00.000

CASE 1

SPACE TRAJECTORIES

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RA-5 PCST MIDCOURSE ORBIT

GEOCENTRIC

X -.28310789 06 Y .26790734 06 Z .12381256 06 DX -.20406783 C1 DY -.27552663 CC DZ .23855658 CC
 R .40896695 C6 DEC .17622528 02 RA .13658C18 C3 V .20729670 C1 PTH .38993974 02 AZ .95843736 02
 R .40896694 06 LAT .17622528 02 LON .19688237 03 VE .26852266 C2 PTE .27843266 01 AZE .26964956 03
 XS -.13163331 C9 YS -.63841423 08 ZS -.27683161 08 DXS .14399249 C2 DYS -.24071591 02 DZS -.10436909 C0
 XM -.27424242 06 YM .26173583 06 ZM .11908381 06 DXM .74234544 CC DYM -.62278692 CC DZM -.17612318 C0
 XT -.27424242 06 YT .26173583 06 ZT .11508381 06 DXT -.74234544 CC DYT -.62278692 CC DZT -.17612318 C0
 RS .14889396 09 VS .29928396 02 RM .39736068 06 VM .98486531 CC RT .39736068 06 VT .98486531 C0
 GED .17735119 C2 ALT .40259072 C6 LOS .26617530 C3 RAS .20587312 C3 RAM .136333670 03 LCM .19663688 C3
 DUT .34000000 02 DT .12000000 03 DR .13043510 C1 SFA .35321845 C6 DES -.10715087 C2 DEM .17438800 C2

EQUATORIAL CCORDINATES

HELIOCENTRIC

X .13135020 09 Y .69880141 08 Z .69837499 04 DX -.16439927 C2 DY .26078938 02 DZ .32745516 CC
 R .14878208 C9 LAT .26894326-02 LON .28013599 C2 ZE .26750000 C2 DXE -.14399249 C2 DYE .26236816 C2 DZE -.10238886-02
 XE .13163331 09 YE .69585089 08 ZY .13135907 C9 YZ .27862195 02 LYT .19642352-02 LYT .28009431 C2 RST .14878637 09 VST .29738829 C2
 XT .10293648-04 LXE .27862195 02 LYE .15114159 C2 DYT .25595368 C2 DYT .14878637 09 VST .29738829 C2
 LTE -.10293648-04 LYE .15114159 C2 DYT .25595368 C2 DYT .14878637 09 VST .29738829 C2
 EPS .10580062 03 ESP .15114412 00 SEP .74047545 C2 EPM .10028232 C2 EMS .10563652 C3 ESM .1472C91C CC
 MPS .11130176 03 MSP .27453512-18 SMP .68694CC7 C2 SEP .74047545 C2 EPM .10028232 C2 EMS .10563652 C3 ESM .1472C91C CC
 EPT .10028232 02 ETP .16967569 C3 TEP .29615789 00 TPS .11130176 C3 TSP .27453512-18 STP .68694C07 02
 SET .74216224 02 STE .10563652 03 EST .14720910 00 RPM .11791735 C5 RPT .11791735 C5 SPN .10490704 03
 GCE .10276921 03 GCT .93919522 02 SIP .10282598 C3 CPT .92448848 C2 SIN .83973003 02 C1 .44705676 C1
 REP .40896695 06 VEP .20729670 C1 CPE .10134361 03 CPS .93290658 C2 D2 .18623701 C1 D3 .25982648 C0

ECLIPTIC CCORDINATES

SELENOCENTRIC

X -.88654674 C4 Y .61715039 04 Z .47287465 C4 DX -.12583329 01 DY .34726030 00 DZ .41467977 C0
 R .11791735 05 DEC .23642092 02 RA .14515712 C3 V .14064511 C1 PTH .70301024 02 AZ .10553859 C3
 R .11791733 05 LAT .96250930 C1 LON .19228771 03 VR .13964068 C1 PTR .71491289 C2 AZR .84357027 02
 LTS .15337130 C1 LNS .26093378 03 LNE .65502017 C1 LNE .65502017 C1 LNE .65502017 C1
 ALT .10053735 C5 SHA -.10985808 C5 ALP .17638034 C3 DR .13241785 C1 DP .23036306-02 ASD .84757839 C1
 AGE .25419537 03 SVL .82407153 01 HNG .24846496 C3 SIA .15524477 C1

EQUATORIAL CCORDINATES

2 DAYS 16 HRS. 33 MIN. 52.000 SEC.

JULIAN DATE 2437559.27083333

OCT. 21, 1962 18 30 00.000

GEOCENTRIC

X -.28673584 06 Y .26738318 06 Z .12422081 C6 DX -.19969622 C1 DY .30485159 00 DZ .21645206 CC
 R .41127157 06 DEC .17580220 02 RA .17580220 C3 V .20316604 C3 PTH .38310407 C2 AZ .96193595 02
 R .41127156 06 LAT .17580220 02 LON .18978229 03 VE .27034729 C2 PTE .26702112 01 AZE .26963509 C3
 XS -.13160738 09 YS -.63884751 08 ZS -.27701947 C8 DXS .14408E13 C2 DYS -.24067005 02 DZS -.10434922 C2
 XM -.27557579 06 YM .26061207 06 ZM .11876554 C6 DXM .73516505 CC DYM -.62583827 C0 DZM -.17751238 CC
 XT -.27557579 06 YT .26061207 06 ZT .11876554 C6 DXT -.73916505 CC DYT -.62583827 C0 DZT -.17751238 CC
 RS .14889312 09 VS .29928619 02 RM .39744926 06 VM .98465686 CC RT .39744926 C6 VT .98465686 CC
 GED .17692576 C2 ALT .40489534 06 LOS .25867447 C3 RAS .20589282 C3 RAM .13659857 03 LCM .18938022 C3
 DUT .34000000 02 DT .24000000 03 DR .12594701 C1 SFA .35468668 C6 DES -.10722505 02 DEM .17386705 C2

EQUATORIAL CCORDINATES

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SPACE TRAJECTORIES

CASE 1

RA-5 POSTMIDCOURSE ORBIT

HELIOCENTRIC

ECLIPTIC COORDINATES

X	.13132064	09	Y	.69927046	08	Z	.75657500	04	DX	-.16405776	02	DY	-.26038242	02	DZ	-.31884229	00
R	.14877803	09	LAT	.29136394	-02	LOX	.28034894	02	V	.30777283	02	PTH	-.41784297	01	AZ	.89404631	02
XE	.13160738	09	YE	.69632313	08	ZE	-.28000000	02	DXE	-.14408813	02	DYE	-.26231819	02	DZE	-.10231733	-02
XT	.13133180	09	YT	.69918665	08	YT	.52545000	04	DXT	-.15147599	02	DYT	.25587018	02	DZT	.85095166	-01
LTE	-.10774721	-04	LDE	.27882924	02	LTT	.20234755	-02	LOT	.28030024	02	RST	.14878394	09	VST	.29734895	02
EPS	.10617476	03	ESP	.15179003	00	SEP	.73673244	02	EPH	.12155719	02	ENP	.16741472	03	MEP	.42949881	00
MPS	.11470432	03	MSP	.27453512	-18	SMP	.65290721	02	SEM	.73982760	02	EMS	.10587012	03	ESM	.14720910	00
EPT	.12155719	02	ETP	.16741472	03	TEP	.42949881	00	TPS	.11470432	03	TSP	.27453512	-18	STP	.65290721	02
SET	.73982760	02	STE	.10587012	03	EST	.14720910	00	RPM	.14150758	05	RPT	.10528618	03	SPN	.10528618	03
GCE	.10268716	03	GCT	.93431173	02	SIP	.10764943	03	CPT	.91733834	02	SIN	.84678936	02	D1	.37127176	01
REP	.41127157	06	VEP	.20316604	01	CPE	.10121968	03	CPS	.93295518	02	D2	.17336505	01	D3	.21142538	00

SELENOCENTRIC

EQUATORIAL COORDINATES

X	-.11164048	05	Y	.67711189	04	Z	.54552658	04	DX	-.12577971	01	DY	-.32098668	00	DZ	-.39396445	00
R	.14150758	05	DEC	.22675436	02	RA	.14876273	03	V	.13565744	01	PTH	.73071295	02	AZ	.10696467	03
R	.14150756	05	LAT	.99247266	01	LOX	.19550382	03	VR	.13462733	01	PTR	.74576771	02	AZR	.84841104	02
LTS	.15338786	01	LNS	.26067986	03	LTE	-.10506180	01	LNE	.65293261	01	DP	.15993746	-02	ASD	.70548581	01
ALT	.12412758	05	SHA	-.12855121	05	ALP	.17562886	03	DR	.12977511	01						
HGE	.25382524	03	SVL	.84024038	01	HNG	.24500934	03	SIA	.51008213	01						

2 DAYS 17 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437959.29166666

OCT. 21, 1962

19 00 CO.C00

GEOCENTRIC

EQUATORIAL COORDINATES

X	-.29030315	06	Y	.26681520	06	Z	.12459560	06	DX	-.19636445	01	DY	-.32513217	00	DZ	-.20078499	00
R	.41350977	06	DEC	.17536441	02	RA	.13741414	03	V	.20000482	01	PTH	.37914990	02	AZ	.96471444	02
R	.41350976	06	LAT	.17536441	02	LOX	.18267526	03	VE	.27212424	02	PTE	.25891283	01	AZE	.26962509	03
XS	-.13158143	09	YS	-.63928068	08	ZS	-.27720728	08	DXS	.14418376	02	DYS	-.24062417	02	DZS	-.10432933	02
XM	-.27690342	06	YM	.25948282	06	ZM	.11844477	06	DXM	-.73597159	00	DYM	-.62887464	00	DZM	-.17889701	00
XT	-.27690342	06	YT	.25948282	06	ZT	.11844477	06	DXT	-.73597159	00	DYT	-.62887464	00	DZT	-.17889701	00
RS	.14889228	09	VS	.25928841	02	RM	.39753742	06	VM	.98444592	00	RT	.39753742	06	VT	.98444592	00
GED	.17648554	02	ALT	.40713352	06	LOS	.25117363	03	RAS	.20591252	03	RAM	.13686018	03	LOM	.18212129	03
DLT	.34000000	02	DT	.24000000	03	DR	.12292790	01	SHA	-.39607640	06	DES	-.10729924	02	DEM	.17334289	02

HELIOCENTRIC

ECLIPTIC COORDINATES

X	.13129113	09	Y	.69973888	08	Z	.81332500	04	DX	-.16382121	02	DY	-.26008401	02	DZ	-.31253695	00
R	.14877401	09	LAT	.31322734	-02	LOX	.28056158	02	V	.30739310	02	PTH	-.41493604	01	AZ	.89415687	02
XE	.13158143	09	YE	.69679528	08	ZE	-.30250000	02	DXE	-.14418376	02	DYE	.26226818	02	DZE	-.10228157	-02
XT	.13130453	09	YT	.69964714	08	YT	.54072499	04	DXT	-.15154348	02	DYT	.25578681	02	DZT	.85033177	-01
LTE	-.11640612	-04	LDE	.27903653	08	LTT	.20823325	-02	LOT	.28050013	02	RST	.14878152	09	VST	.29730967	02
EPS	.10654290	03	ESP	.15243321	00	SEP	.73304555	02	EPH	.16564073	03	EMS	.10610362	03	ESM	.14754103	00
MPS	.11173407	03	MSP	.98911702	-02	SMP	.62860287	02	SEM	.73749407	02	TSP	.98911702	-02	STP	.62860287	02
EPT	.13793414	02	ETP	.16564073	03	TEP	.56584330	00	TPS	.11713407	03	RPT	.16466612	05	SPN	.10565914	03
SET	.73749407	02	STE	.10610362	03	EST	.14754103	00	RPM	.16466612	05	SIN	.85159663	02	D1	.31841931	01
GCE	.10260739	03	GCT	.93065887	02	SIP	.11107539	03	CPT	.91218341	02	D2	.15941236	01	D3	.17324346	00
REP	.41350977	06	VEP	.20004812	01	CPE	.10109843	03	CPS	.93300372	02						

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SPACE TRAJECTORIES

CASE 1

RA-5 PCSTMIDCOURSE ORBIT

SELENOCENTRIC

X	-13399730	05	Y	.73323870	04	Z	.61508249	C4	DX	-.12276729	C1	DY	.30374248	00	DZ	.37968200	C0
R	.16466612	C5	CEC	.21933679	C2	RA	.15131234	03	V	.13204540	C1	PTH	.75107124	C2	AZ	.10794289	C3
R	.16466609	C5	LAT	.10116789	C2	LON	.19773268	03	VR	.13100568	C1	PTR	.76525745	C2	AZR	.85155731	C2
LTS	.15340442	C1	LNS	.26042594	C3	LTE	-.10795379	C1	LNE	.65083395	C1						
ALT	.14728612	05	SHA	-.14653586	05	ALP	.17506127	C3	DR	.12760974	C1	DP	.11808532	-02	ASC	.60586783	C1
HGE	.25345709	C3	SVL	.84831546	C1	HNG	.24254005	03	SIA	.77347356	C1						

2 DAYS 17 HRS. 33 MIN. 52.000 SEC.

JULIAN DATE 2437959.31250000

OCT. 21, 1962 19 30 00.000

GEOCENTRIC

X	-.29381304	06	Y	.26621578	C6	Z	.12494592	C6	DX	-.19371653	C1	DY	-.34023787	C0	DZ	.18896244	00
R	.41570233	06	CEC	.17491591	C2	RA	.13782115	03	V	.19758740	C1	PTH	.37691583	02	AZ	.56706126	02
R	.41570231	06	LAT	.17491591	C2	LON	.17556174	03	VE	.27386256	C2	PTE	.25282679	01	AZE	.26961763	C3
XS	-.13155547	C9	YS	-.63971377	08	ZS	-.27739506	C8	CXS	.14427537	C2	DYS	-.24057824	02	DZS	-.10430942	C2
XM	-.27822529	06	YM	.25834812	06	ZM	.11812152	C6	DXM	-.73276517	C0	DYM	-.63189603	C0	DZM	-.18027706	00
XT	-.27822529	06	YT	.25834812	C6	ZT	.11812152	06	DMT	-.73276517	C0	DYT	-.63189603	C0	DZT	-.18027706	00
RS	.14889143	09	VS	.29929063	02	RM	.39762514	06	VM	.98424447	CC	RT	.39762514	06	VT	.98424447	00
GED	.17603454	C2	ALT	.40932607	06	LOS	.24367281	C3	RAS	.20593223	C3	RAM	.13712153	03	LOM	.17486211	C3
DUT	.34000000	02	DT	.24000000	03	DR	.12080708	C1	SHA	-.35741390	06	DES	-.10737339	02	DEM	.17281555	02

HELIOCENTRIC

X	.13126166	09	Y	.70020682	C8	Z	.86917499	04	DX	-.16365103	C2	DY	.25984833	02	DZ	.30770099	00
R	.14877002	09	LAT	.33474525	-02	LON	.28077400	C2	V	.30710304	C2	PTH	-.41248511	C1	AZ	.89424185	02
XE	.13155547	C9	YE	.69726732	C8	ZE	-.31500000	02	DXE	-.14427537	C2	DYE	.26221812	C2	DZE	-.10219812	-02
XT	.13121725	09	YT	.70010749	08	ZT	.55607500	04	DMT	-.15160703	C2	DYT	.25570354	02	DZT	.84969996	-01
LTE	-.12121698	-04	LOE	.27924380	C2	LTT	.21414802	-02	LCT	.28071199	C2	RST	.14877909	C9	VST	.29727044	02
EPS	.10690540	C3	ESP	.15307370	00	SEP	.72941543	02	EPM	.15016216	C2	EMP	.16428387	C3	MEP	.69994006	00
MPS	.11896210	C3	MSP	.27453512	-18	SMP	.61031578	02	SEM	.73516162	C2	EMS	.10633700	C3	ESM	.14687642	00
EPT	.15016216	02	ETP	.16428387	C3	TEP	.69994006	00	TPS	.11896210	C3	TSP	.27453512	-18	STP	.61031578	02
SET	.73516162	02	STE	.10633700	C3	EST	.14687642	00	RPM	.18747014	C5	RPT	.18747014	C5	SPN	.10602629	C3
GCE	.10252943	03	GCT	.92780507	02	SIP	.11364268	03	CPT	.90828197	C2	SIN	.85508774	C2	D1	.27932727	C1
REP	.41570233	06	VEP	.19758740	C1	CPE	.10097936	03	CPS	.93330322	C2	D2	.14659930	C1	D3	.14397686	00

SELENOCENTRIC

X	-.15587754	C5	Y	.78676527	04	Z	.68244023	C4	DX	-.12044002	C1	DY	.29165815	00	DZ	.36923550	C0
R	.18747014	05	CEC	.21347659	02	RA	.15321841	03	V	.12930514	C1	PTH	.76676505	02	AZ	.10865941	03
R	.18747011	05	LAT	.10248860	C2	LON	.19934937	03	VR	.12826505	C1	PTR	.78805853	02	AZR	.85353838	02
LTS	.15342073	C1	LNS	.26017202	C3	LTE	-.11084227	C1	LNE	.64872615	C1						
ALT	.17009014	C5	SHA	-.16401514	05	ALP	.17461658	C3	DR	.12582483	C1	DP	.91071077	-03	ASC	.53194221	C1
HGE	.25309459	03	SVL	.85199958	01	HNG	.24068344	C3	SIA	.96567539	C1						

2 DAYS 18 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437959.33333333

OCT. 21, 1962 20 00 00.000

CASE 1

SPACE TRAJECTORIES

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RA-5 POSTMIDCOURSE ORBIT

GEOCENTRIC

EQUATORIAL COORDINATES

X	-29727978	06	Y	-26559227	06	Z	.12527734	06	DX	-.19154212	C1	DY	-.35211445	00	DZ	.17962242	00
R	.41786233	06	DEC	.17445908	02	RA	.13822212	03	V	.19557829	C1	PTH	.37578745	02	AZ	.96912535	02
R	.41786232	06	LAT	.17445909	02	LON	.16844218	03	VE	.27557080	C2	PTE	.24806735	C1	AZE	.26961176	03
XS	-.13152949	09	YS	-.64014678	08	ZS	-.27758281	08	DXS	.14437458	C2	DYS	-.24053228	C2	DZS	-.10428950	02
XM	-.27954137	06	YM	.25720800	06	ZM	.11779578	06	DXM	-.72954582	CC	DYM	-.63490237	00	DZM	-.18165249	00
XT	-.27954137	06	YT	.25720800	06	ZT	.11779578	06	DXT	-.72954582	CC	DYT	-.63490237	00	DZT	-.18165249	00
RS	.14889059	09	VS	.25929285	02	RM	.39771243	06	VM	.98404051	CC	RT	.39771243	06	VT	.98404051	00
GED	.17557517	02	ALT	.41148606	06	LOS	.23671798	03	RAS	.20595193	C3	RAM	.13738262	03	LOM	.16760266	03
DUT	.34000000	02	DT	.24000000	03	DR	.11927366	C1	SHA	-.39870588	C6	DES	-.10744755	02	DEM	.17228506	02

HELIOCENTRIC

ECLIPTIC COORDINATES

X	.13123221	09	Y	.70067437	08	Z	.92417499	04	DX	-.16352919	C2	DY	.25965212	02	DZ	.30385721	00
R	.14876605	09	LAT	.35593688	-02	LON	.28098626	02	V	.30687172	C2	PTH	-.41039020	01	AZ	.89430948	02
XE	.13152549	09	YE	.65773528	08	ZE	-.34000000	C2	DXE	-.14437458	C2	DYE	.26216803	02	DZE	-.10211468	-02
XT	.13124595	09	YT	.70056769	08	ZT	.57130000	C4	DXT	-.15167044	C2	DYT	.25562039	C2	DZT	.84904788	-01
LTE	-.13083812	-04	LOE	.27945110	02	LTT	.28091484	-02	LCT	.28091785	C2	RST	.14877668	09	VST	.29723127	02
EPS	.10726257	03	ESP	.15355230	00	SEP	.72583865	02	EPH	.15930725	C2	EMP	.16323894	03	MEP	.83030605	00
MPS	.12039028	03	MSP	.27453512	-18	SMP	.59602743	C2	SEM	.73283026	C3	EMS	.10657028	03	ESM	.14604142	00
EPT	.15930725	02	ETP	.16323894	03	TEP	.83030605	00	TSP	.27453512	-18	TSP	.27453512	-18	STP	.59602743	02
SET	.73283026	02	STE	.10657028	03	EST	.14604142	00	RPM	.20998113	C5	RPT	.20998113	C5	SPN	.10638801	03
GCE	.10245295	03	GCT	.92550565	02	SIP	.11564251	03	CPT	.90522128	C2	SIN	.85774361	02	D1	.24916297	C1
REP	.41786233	06	NEP	.19557829	01	CPE	.10086214	C3	CPS	.93310079	C2	D2	.13530139	01	C3	.12139802	00

SELENOCENTRIC

EQUATORIAL COORDINATES

X	-.17738405	05	Y	.83842685	04	Z	.74815633	04	DX	-.11858753	C1	DY	.28278792	00	DZ	.36127491	00
R	.20998113	05	DEC	.20872950	02	RA	.15470168	03	V	.12715301	C1	PTH	.77929262	02	AZ	.10921063	03
R	.20998110	05	LAT	.10344391	02	LON	.20055847	C3	VR	.12612002	C1	PTR	.80366889	C2	AZR	.85463539	02
LTS	.15343721	01	LNS	.25991810	03	LTE	-.11372743	01	LNE	.64660785	C1	DP	.72554192	-03	ASD	.47477660	01
ALT	.19260113	05	SHA	-.18111668	05	ALP	.17425830	03	DR	.12434168	C1						
HGE	.25273742	03	SVL	.85308217	01	HNG	.23923306	03	SIA	.11182959	C2						

2 DAYS 18 HRS. 33 MIN. 52.000 SEC.

JULIAN DATE 2437959.35416666

OCT. 21, 1962 20 30 00.000

GEOCENTRIC

EQUATORIAL COORDINATES

X	-.30007106	06	Y	.26494944	06	Z	.12559357	C6	DX	-.18970548	C1	DY	-.36184120	00	DZ	.17198157	00
R	.41999859	06	DEC	.17399550	02	RA	.13861743	C3	V	.19389367	C1	PTH	.37540929	02	AZ	.97099167	02
R	.41999858	06	LAT	.17399550	02	LON	.1631695	C3	VE	.27725582	C2	PTE	.24422383	C1	AZE	.26960698	03
XS	-.13150349	09	YS	-.64057973	08	ZS	-.27777052	08	DXS	.14447056	C2	DYS	-.24048629	02	DZS	-.10428957	02
XM	-.28085165	06	YM	.25606247	06	ZM	.11746757	06	DXM	-.72631362	CC	DYM	-.63789364	00	DZM	-.18302331	00
XT	-.28085165	06	YT	.25606247	06	ZT	.11746757	06	DXT	-.72631362	CC	DYT	-.63789364	00	DZT	-.18302331	00
RS	.14888974	09	VS	.29929507	02	RM	.39779528	C6	VM	.98383804	CC	RT	.39779528	06	VT	.98383804	00
GED	.17510899	02	ALT	.41362231	C6	LOS	.22867114	03	RAS	.20597163	C3	RAM	.13764345	03	LOM	.16034296	03
DUT	.34000000	02	DT	.48000000	03	DR	.11814485	01	SHA	-.39996289	C6	DES	-.10752169	02	DEM	.17175141	02

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SPACE TRAJECTORIES

CASE 1

RA-5 PCSTMIDCOURSE ORBIT

HELIOCENTRIC

ECLIPTIC CCORDINATES

X	.13120278	C9	Y	.70114163	O8	Z	.97854999	C4	DX	-.16344151	C2	DY	.25948236	O2	DZ	.30071747	C0
R	.14876211	O9	LAT	.37688886	-O2	LCN	.28119840	O2	V	.30668104	C2	PTH	-.40857337	O1	AZ	.89436474	O2
XE	.13150349	O9	YE	.69821116	C8	ZE	-.36250000	O2	DXE	-.14447056	C2	CYE	.26211790	O2	DZE	-.10205507	-O2
XT	.13122264	C9	YT	.70122776	O8	ZT	.58655000	C4	DXT	-.15173369	C2	DYT	.25553737	O2	DZT	.84837794	-O1
LTE	-.13949731	-O4	LOE	.27965840	O2	LTT	.22589148	-C2	LOT	.28112367	C2	RST	.14877426	O9	VST	.29719216	C2
EPS	.10761474	O3	ESP	.15387055	C0	SEP	.72231215	O2	EPH	.16617470	C2	EMP	.16242585	O3	MEP	.95664632	O0
MPS	.12153825	O3	MSP	.27453512	-18	SMP	.58454123	O2	SEM	.73049997	C2	EMS	.10680345	C3	ESM	.14604142	O0
EPT	.16617470	O2	ETP	.16242585	O3	TEP	.95664632	CC	TSP	.12153825	C3	TSP	.27453512	-18	STP	.58454123	O2
SET	.73049997	O2	STE	.1C680345	O3	EST	.14604142	CC	RPM	.23224731	C5	RPT	.23224731	O5	SPN	.10674462	C3
GCE	.10237773	O3	GCT	.92360972	O2	SIP	.11724656	O3	CPT	.9C275333	C2	SIN	.85983646	O2	D1	.22513334	O1
REP	.41999859	O6	VEP	.19389367	O1	CPE	.1C074655	O3	CPS	.93314929	C2	D2	.12545623	C1	D3	.10371890	O0

SELENOCENTRIC

EQUATORIAL CCORDINATES

X	-.19858956	C5	Y	.88869613	C4	Z	.81260030	C4	DX	-.11707812	C1	DY	.27605244	CC	DZ	.35500488	C0
R	.23224731	O5	CEC	.20480328	O2	RA	.15589129	O3	V	.12541778	C1	PTH	.78956265	O2	AZ	.1C965140	O3
R	.23224731	O5	LAT	.1C416152	O2	LON	.2C148155	O3	VR	.12439823	C1	PTR	.81699771	O2	AZR	.85499025	O2
LTS	.15345369	C1	LNS	.25966416	O3	LTE	-.11660926	C1	LNE	.64447875	C1	DP	.59269560	-C3	ASC	.42916861	O1
ALT	.21486731	O5	SHA	-.19792615	C5	ALP	.17396325	C3	DR	.123C9521	C1						
HGE	.25238525	O3	SVL	.85251952	O1	HNG	.238C6804	C3	SIA	.12325784	C2						

2 DAYS 19 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437959.375CCCCC

OCT. 21, 1962 21 CC CO.000

GEOCENTRIC

EQUATORIAL CCORDINATES

X	-.30411C85	O6	Y	.26429053	C6	Z	.12589570	C6	DX	-.18813203	O1	DY	-.37C00627	CC	DZ	.16555731	O0
R	.42211727	O6	CEC	.17352626	C2	RA	.139C0740	O3	V	.19245056	C1	PTH	.37556143	C2	AZ	.97271243	O2
R	.42211727	O6	LAT	.17352626	C2	LON	.15418638	C3	VE	.27892288	C2	PTE	.241C3874	O1	AZE	.26960298	O3
XS	-.13147748	C9	YS	-.64101256	O8	ZS	-.27795820	C8	DXS	.14456613	C2	DYS	-.24044026	C2	DZS	.10424962	C2
XH	-.28215610	O6	YH	.25491158	O6	ZH	.11713689	O6	DXH	-.72306868	CC	DYH	-.64086980	CC	DZH	.18438948	CC
XT	-.28215610	O6	YT	.25491158	O6	ZT	.11713689	O6	DXT	-.72306868	CC	DYT	-.64086980	CC	DZT	.18438948	CC
RS	.14888890	O9	VS	.25929729	O2	RM	.39788570	C6	VM	.983637C6	CC	RT	.39788570	O6	VT	.98363706	CC
GED	.17463713	O2	ALT	.41574C99	O6	LQS	.22117032	C3	RAS	.20599134	C3	RAM	.13790402	C3	LCM	.15308300	C3
DUT	.34C00C0C	O2	DT	.48C0C0C0	O3	DR	.11730603	C1	SHA	-.4C119C93	C6	DES	-.10759582	C2	DEM	.17121462	O2

HELIOCENTRIC

ECLIPTIC CCORDINATES

X	.13117337	C9	Y	.70160855	O8	Z	.1C325000	C5	DX	-.16337533	C2	DY	.25933312	O2	DZ	.29809535	CC
R	.14875819	C9	LAT	.39767822	-O2	LCN	.28141C41	C2	V	.3C651577	C2	PTH	-.40697588	C1	AZ	.89441C89	C2
XE	.13147748	O9	YE	.69868294	O8	ZE	.37C0C0C0	O2	DXE	-.14456613	C2	CYE	.26206774	C2	DZE	-.10195970	-O2
XT	.13119532	O9	YT	.70148766	O8	ZT	.6C190C00	O4	DXT	-.15179682	C2	DYT	.25545447	O2	DZT	.84769486	-O1
LTE	-.14238427	-O4	LOE	.27986569	O2	LTT	.23180603	-O2	LCT	.28132548	C2	RST	.14877184	O9	VST	.29715312	O2
EPS	.10796215	O3	ESP	.15466329	C0	SEP	.71883325	O2	EPH	.17133191	C2	EMP	.16178793	O3	MEP	.10788792	O1
MPS	.12248168	O3	MSP	.27453512	-18	SMP	.57510052	O2	SEM	.72817C75	C2	EMS	.10703653	O3	ESM	.14637599	O0
EPT	.17133191	O2	ETP	.16178793	O3	TEP	.1C788792	O1	TSP	.12248168	C3	TSP	.27453512	-18	STP	.57510052	O2
SET	.72817C75	O2	STE	.1C7C3653	O3	EST	.14637599	CC	RPM	.25430664	C5	RPT	.25430664	O5	SPN	.10709640	C3
GCE	.10230359	O3	GCT	.92201836	O2	SIP	.11856288	C3	CPT	.9CCT1989	C2	SIN	.86153185	C2	D1	.20550857	O1
REP	.42211727	O6	VEP	.19245056	C1	CPE	.10C63240	O3	CPS	.93319780	C2	D2	.11686815	C1	D3	.89651548	-O1

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SPACE TRAJECTORIES

CASE 1

RA-5 POSTMIDCOURSE ORBIT

SELENOCENTRIC

X	-21954751	05	Y	93789469	04	Z	-87603047	04	DX	-11582516	C1	DY	-27080702	00	DZ	.34994679	00
R	25430664	05	DEC	20149934	02	RA	15686809	03	V	12398576	C1	PTH	.79816085	02	AZ	.11001530	03
R	25430660	05	LAT	10471646	02	LON	20219561	03	VR	12298518	C1	PTR	.82863227	02	AZR	.85465207	02
LTS	15347008	01	LNS	25941024	03	LTE	11948758	01	LNE	64234099	C1						
ALT	23692664	05	SHA	21450401	05	ALP	17371600	03	DR	12203634	C1	DP	.49391629	-03	ASD	.39188030	01
HGE	25203784	03	SVL	85086346	01	HNG	23711145	03	SIA	13214388	02						

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JULIAN DATE 2437959.39583333

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GEOCENTRIC

X	-30748454	06	Y	26361786	06	Z	12619011	06	DX	-18675045	C1	DY	-37718708	00	DZ	.16003599	00
R	42422289	06	DEC	17305216	02	RA	13939229	03	V	19119243	C1	PTH	.37610044	02	AZ	.97432157	02
R	42422288	06	LAT	17305216	02	LON	14705074	03	VE	28057603	C2	PIE	.23834150	01	AZE	.26959957	03
XS	13145145	09	YS	-64144532	08	ZS	-27814583	08	DXS	14466168	C2	DYS	-24039420	02	DZS	-.10422966	02
XM	28345470	06	YM	25375535	06	ZM	11680377	06	DXT	171981105	00	DYM	-.64383083	00	DZM	-.18575099	00
XT	28345470	06	YT	25375535	06	ZT	11680377	06	DXT	171981105	00	DYT	-.64383083	00	DZT	-.18575099	00
RS	14888806	09	VS	29929950	02	RM	39797168	06	VM	98343759	00	RT	.39797168	06	VT	.98343759	00
GED	17416038	02	ALT	41784659	06	LQS	21366949	03	RAS	20601104	C3	RAM	.13816434	03	LOM	.14582279	03
DUT	34000000	02	DT	48000000	03	DR	11668170	01	SHA	-40239440	06	DES	-.10766993	02	DEM	.17067472	02

HELIOCENTRIC

X	13114396	09	Y	70207524	08	Z	10859250	05	DX	-16333672	C2	DY	-25919368	02	DZ	.29586470	00
R	14875428	09	LAT	41826640	-02	LON	28162233	02	V	30638048	C2	PTH	-.40555366	01	AZ	.89445014	02
XE	13145145	09	YE	69915463	08	ZE	-39500000	C2	DXE	-14466168	C2	DVE	.26201754	02	DZE	-.10187626	-02
XT	13116799	09	YT	70194742	08	ZT	61712500	04	DXT	-15185979	C2	DYT	.25537169	02	DZT	.84699153	-01
LTE	15200568	-04	LOE	28007299	02	LTT	23767420	-02	LCT	28153525	C2	RST	.14876943	09	VST	.29711413	02
EPS	10830504	03	FSP	15482135	00	SEP	71539971	C2	EPH	17517552	C2	EMP	.16128508	03	MEP	.11969351	01
MPS	12327089	03	MSP	27453512	-18	SMP	56720208	C2	SEM	72584262	C2	EMS	.10726949	03	ESM	.14604142	00
EPT	17517552	02	ETP	16128508	03	TEP	11969351	C1	TPS	12327089	C3	TSP	.27453512	-18	STP	.56720208	02
SET	72584262	02	STE	10726949	03	EST	14604142	00	RPM	27618941	05	RPT	.27618941	05	SPN	.10744359	03
GCE	10223043	C3	GCT	92066357	02	SIP	11966301	C3	CPT	89901505	C2	SIN	.86293621	02	CI	.18915838	C1
REP	42422289	06	VEP	19119243	01	CPE	10051957	C3	CPS	93324628	C2	DZ	.10934307	01	C3	.78285311	-01

SELENOCENTRIC

X	-24029841	05	Y	98625126	04	Z	93863478	04	DX	-11476935	C1	DY	.26664375	00	DZ	.34578698	00
R	27618941	05	DEC	15867846	02	RA	15768539	03	V	12279527	C1	PTH	.80548348	02	AZ	.11032405	03
R	27618936	05	LAT	10515546	02	LON	20275193	C3	VR	12181867	C1	PTR	.83896948	02	AZR	.85359140	02
LTS	15348639	01	LNS	25915632	03	LTE	-12236250	01	LNE	64019332	C1						
ALT	25880941	05	SHA	-23089460	05	ALP	17350586	03	DR	12112826	C1	DP	.41832172	-03	ASD	.36078826	01
HGE	25169495	03	SVL	84845147	01	HNG	23631210	03	SIA	13910070	C2						

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JULIAN DATE 2437959.41666666

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CASE 1

SPACE TRAJECTORIES

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RA-5 PCSTMIDCOURSE ORBIT

GEOCENTRIC

X	-	.31083480	06	Y	.26293314	06	Z	.12647374	06	DX	-.18552273	01	DY	-.38348445	00	DZ	.15520476	00	EQUATORIAL COORDINATES		
R	.42631879	06	DEC	.17257385	02	RA	.13977233	03	V	.19007938	01	PTH	.37692886	02	AZ	.97584222	02				
R	.42631878	06	LAT	.17257386	02	LON	.13991025	03	VE	.28221842	02	PTE	.23601565	01	AZE	.26959663	03				
XS	-.13142540	09	YS	-.64187800	08	ZS	-.27833344	08	DXS	.14475722	02	DYS	-.24034811	02	DZS	-.10420968	02				
XM	-.28474742	06	YM	.25259380	06	ZM	.11646819	06	DXM	-.71654080	00	DYM	-.64677668	00	DZM	-.18710782	00				
XT	-.28474742	06	YT	.25259380	06	ZT	.11646819	06	DXT	-.71654080	00	DYT	-.64677668	00	DZT	-.18710782	00				
RS	.14888722	09	VS	.25930172	02	RM	.39805723	06	VM	.98323560	00	RT	.39805723	06	VT	.98323560	00				
GED	.17367540	02	ALT	.41994248	06	LOS	.20616866	03	RAS	.20603075	03	RAM	.13842440	03	LOM	.13856231	03				
DLT	.34000000	02	DT	.48000000	03	DR	.11622001	01	SHA	-.40357666	06	DES	-.10774404	02	DEM	.17013173	02				

HELIOCENTRIC

X	.13111456	09	Y	.70254168	08	Z	.11390500	05	DX	-.16330949	02	DY	.25906645	02	DZ	.29393864	00	EQUATORIAL COORDINATES		
R	.14875039	09	LAT	.43874007	-02	LON	.28183417	02	V	.306225815	02	PTH	-.40427334	01	AZ	.89448399	02			
XE	.13142540	09	YE	.69962623	08	ZE	-.40500000	02	DXE	-.14475722	02	DYE	.26196731	02	DZE	-.10176897	-02			
XT	.13114065	09	YT	.70240702	08	ZT	.63242500	04	DXT	-.15192262	02	DYT	.25528903	02	DZT	.84627270	-01			
LTE	-.15585481	-04	LOE	.28028030	02	LTT	.24357066	-02	LCT	.28174100	02	RST	.14876702	09	VST	.29707522	02			
EPS	.10864359	03	ESP	.15513699	00	SEP	.71200958	02	EPM	.17800539	02	EMS	.16088841	03	MEP	.13110285	01			
MPS	.12394073	03	MSP	.98911702	-02	SMP	.56049748	02	SEM	.72351552	02	STP	.10750235	03	EST	.14587384	00			
EPT	.17800539	02	ETP	.16088841	03	TEP	.13110285	01	TPS	.12394073	03	TSP	.98911702	-02	STP	.56049748	02			
SET	.72351552	02	STE	.10750235	03	EST	.14587384	00	RPM	.25792017	05	RPT	.2972017	05	SPN	.10778638	03			
GCE	.10215813	03	GCT	.91949689	02	SIP	.12059632	03	CPT	.89756528	02	SIN	.86412121	02	D1	.17531190	01			
REP	.42631879	06	VEP	.19007938	01	CPE	.10040796	03	CPS	.93329475	02	D2	.10210662	01	D3	.68972392	-01			

SELENOCENTRIC

X	-.26087376	05	Y	.10339349	05	Z	.10005547	05	DX	-.11386865	01	DY	.26329223	00	DZ	.34231257	00	EQUATORIAL COORDINATES		
R	.29792017	05	DEC	.19624025	02	RA	.15837582	03	V	.12178290	01	PTH	.81180874	02	AZ	.11059241	03			
R	.29792011	05	LAT	.10550906	02	LON	.20318602	03	VR	.12083488	01	PTR	.84828874	02	AZR	.85169094	02			
LTS	.15350278	01	LNS	.25890237	03	LTE	-.12523374	01	LNE	.63803439	01	DP	.35908336	-03	ASD	.33444063	01			
ALT	.28054017	05	SHA	-.24713157	05	ALP	.17332515	03	DR	.12034310	01									
HGE	.25135640	03	SVL	.84550031	01	HNG	.23563451	03	SIA	.14456133	02									

2 DAYS 20 HRS. 33 MIN. 52.000 SEC.

JULIAN DATE 2437559.43750000

OCT. 21, 1962 22 30 00.000

GEOCENTRIC

X	-.31416410	06	Y	.26223769	06	Z	.12674917	06	DX	-.18441826	01	DY	-.38914105	00	DZ	.15091396	00	EQUATORIAL COORDINATES		
R	.42840756	06	DEC	.17209184	02	RA	.14014772	03	V	.18908240	01	PTH	.37797804	02	AZ	.97729067	02			
R	.42840755	06	LAT	.17209185	02	LON	.13276510	03	VE	.28385248	02	PTE	.23957786	01	AZE	.26959406	03			
XS	-.13139933	09	YS	-.64231062	08	ZS	-.27852101	08	DXS	.14485274	02	DYS	-.24030198	02	DZS	-.10418969	02			
XM	-.28603425	06	YM	.25142695	06	ZM	.11613018	06	DXM	-.71325801	00	DYM	-.64970733	00	DZM	-.18845995	00			
XT	-.28603425	06	YT	.25142695	06	ZT	.11613018	06	DXT	-.71325801	00	DYT	-.64970733	00	DZT	-.18845995	00			
RS	.14888638	09	VS	.25930393	02	RM	.39814203	06	VM	.98304310	00	RT	.39814203	06	VT	.98304310	00			
GED	.17319469	02	ALT	.42203124	06	LOS	.19866784	03	RAS	.20605646	03	RAM	.13868420	03	LOM	.13130158	03			
DLT	.34000000	02	DT	.48000000	03	DR	.11588422	01	SHA	-.40474029	06	DES	-.10781814	02	DEM	.16958564	02			

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SPACE TRAJECTORIES

CASE 1

RA-5 PCSTMIDCOURSE OREIT

HELIOCENTRIC

ECLIPTIC CCORDINATES

X	.13108517	C9	Y	.7C300792	C8	Z	.11917500	C5	DX	-.16329456	C2	DY	-.25894720	O2	DZ	-.29225314	O0
R	.14874651	C9	LAT	.459C51C7	-02	LON	.28204595	C2	V	.30614916	C2	PTH	-.40310948	O1	AZ	.89451361	O2
XE	.13139933	O9	YE	.7C0C9776	C8	ZE	-.42750C0C	C2	DXE	-.14485274	C2	DYE	.26191703	O2	DZE	-.1017C936	-02
XT	.13111330	O9	YT	.7C28665C	C8	ZT	.6476C0C0	O4	DXT	-.15198532	C2	DYT	.25520048	O2	DZT	.84553359	-01
LTE	-.16451434	-04	LOE	.2E04876C	O2	LTT	.24941917	-02	LOT	.28194674	C2	RST	.14876461	O9	VST	.297C3636	O2
EPS	.10897797	C3	ESP	.15560925	O0	SEP	.70866121	C2	EPH	.18C0C273	C2	EMP	.16C57672	O3	MEP	.14211501	C1
MPS	.12451612	O3	MSP	.27453512	-18	SMP	.5547374C	C2	SEM	.72118948	C2	EMS	.10773511	O3	FSM	.14604142	O0
EPT	.18C02073	O2	ETP	.16057672	O3	TEP	.14211501	O1	TPS	.12451612	C3	TSP	.27453512	-18	STP	.5547374C	O2
SET	.72118948	O2	STE	.1C773511	O3	EST	.14604142	O0	RPM	.31951901	C5	RPT	.31951901	O5	SPN	.10812494	O3
GCE	.1C208663	C3	GCT	.91848265	O2	SIP	.121398C2	C3	CPT	.89631772	C2	SIN	.86513673	O2	D1	.16342472	O1
REP	.42840756	O6	VEP	.189C824C	O1	CPE	.10C29748	C3	CPS	.93334322	O2	D2	.96828608	O0	D3	.61245602	-01

SELENGCENTRIC

EQUATORIAL CCORDINATES

X	-.28129E58	C5	Y	.1C810738	C5	Z	.1C618994	C5	DX	-.11309247	C1	DY	.26C56628	O0	DZ	.33937391	O0
R	.31951901	O5	DEC	.19411052	O2	RA	.15897746	C3	V	.12C91567	C1	PTH	.81733823	O2	AZ	.11083C74	C3
R	.31951898	O5	LAT	.1C579796	O2	LCN	.2C352337	O3	VR	.12C0C0C0	C1	PTR	.85679205	O2	AZR	.8487C688	O2
LTS	.15351917	O1	LNS	.25864843	O3	LTE	-.12810139	O1	LNE	.63586678	C1	DP	.31173297	-03	ASC	.31180991	C1
ALT	.30213501	O5	SHA	-.263241C1	O5	ALP	.17316825	C3	DR	.11965946	C1						
HGE	.251C2202	O3	SVL	.842154C3	O1	HNG	.23505327	C3	SIA	.14883574	C2						

2 DAYS 21 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437559.45833333

OCT. 21, 1962 23 00 C0.000

GEOCENTRIC

EQUATORIAL CCORDINATES

X	-.31747446	C6	Y	.26153253	O6	Z	.127C1729	C6	DX	-.18341421	C1	DY	-.39428905	O0	DZ	.14705531	C0
R	.43049122	O6	DEC	.17160654	O2	RA	.14051861	C3	V	.18817987	C1	PTH	.37919839	O2	AZ	.97867883	O2
R	.43049121	O6	LAT	.17160654	C2	LON	.12561546	C3	VE	.28548C19	C2	PTE	.23216760	O1	AZE	.26959181	O3
XS	-.13137325	O9	YS	-.64274313	O8	ZS	-.27870854	O8	DXS	.14494E24	C2	DYS	-.24C23582	O2	DZS	-.10416968	O2
XM	-.28731515	O6	YM	.25025485	O6	ZM	.11578574	C6	DXM	-.7C996276	C0	DYM	-.65262274	O0	DZM	-.1898C737	O0
XT	-.28731515	O6	YT	.25025485	C6	ZT	.11578974	O6	DXT	-.7C996276	C0	DYT	-.65262274	O0	DZT	-.1898C737	O0
RS	.14888554	O9	VS	.29930615	C2	RM	.39822700	O6	VM	.98284810	CC	RT	.398227C0	O6	VT	.98284810	O0
GED	.17270665	C2	ALT	.42411489	O6	LOS	.19116702	C3	RAS	.20C07C17	C3	RAM	.13854375	O3	LCM	.12404C60	O3
DLT	.34C00C00	O2	DT	.95999999	O3	DR	.11564752	C1	SHA	-.4C588737	C6	DES	-.10789221	O2	CEM	.16903649	C2

HELIOCENTRIC

ECLIPTIC CCORDINATES

X	.13105578	O9	Y	.70347394	O8	Z	.12442000	O5	DX	-.16328966	C2	DY	-.25883431	O2	DZ	-.29076147	O0
R	.14874264	O9	LAT	.47926679	-02	LON	.28225765	O2	V	.30605C92	C2	PTH	-.402C4217	O1	AZ	.89453397	O2
XE	.13137325	O9	YE	.7C056918	O8	ZE	-.4500C0C0	C2	DXE	-.14494824	C2	DYE	.26186671	O2	DZE	-.10163784	-02
XT	.13108594	O9	YT	.7C332582	O8	ZT	.6277499	O4	DXT	-.15204787	C2	DYT	.25512406	C2	DZT	.84477662	-01
LTE	-.17317397	-04	LOE	.28069491	O2	LTT	.25526785	-02	LOT	.28215244	C2	RST	.14876221	O9	VST	.29699756	O2
EPS	.10930834	O3	ESP	.15639318	O0	SEP	.70535313	O2	EPH	.18138370	C2	EMP	.16C33407	O3	MEP	.15275667	O1
MPS	.125C154C	O3	MSP	.27453512	-18	SMP	.55973844	O2	SEM	.71886449	C2	EMS	.10796777	C3	FSM	.14587384	O0
EPT	.18138370	O2	ETP	.16033407	O3	TEP	.15275667	O1	TPS	.125C154C	C3	TSP	.27453512	-18	STP	.54973844	O2
SET	.71886449	O2	STE	.1C796777	O3	EST	.14587384	O0	RPM	.341C00266	C5	RPT	.341C00266	O5	SPN	.10845943	O3
GCE	.10201585	C3	GCT	.917594C3	O2	SIP	.12209392	O3	CPT	.89523347	C2	SIN	.86601868	O2	D1	.15310101	O1
REP	.43C49122	O6	VEP	.18817987	O1	CPE	.10018807	O3	CPS	.93339169	C2	D2	.91580432	O0	D3	.54762536	-01

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SPACE TRAJECTORIES

CASE 1

RA-5 PCSTMIDCOURSE ORBIT

SELENOCENTRIC

X	-30159313	05	Y	.11277682	05	Z	.11227549	05	DX	-.11241793	C1	DY	-.25833370	00	DZ	-.33686268	C0
R	.34100266	05	CEC	.19223324	02	RA	.15949737	03	V	.12016622	C1	PTH	-.82222180	02	AZ	-.11104660	03
R	.34100261	05	LAT	.1C6C3671	02	LON	.20378271	C3	VR	-.11928793	C1	PTR	.86462960	02	AZR	.84417527	02
LTS	.15353548	01	LNS	.25839450	03	LTE	-.13096546	C1	LNE	.63369C48	C1						
ALT	.32362266	05	SHA	-.27924371	05	ALP	.173C03089	C3	DR	.11906C72	C1	DP	.27324191	-03	ASD	.29214785	01
HGE	.25069165	03	SVL	.83851235	01	HNG	.23454969	03	SIA	.15216891	C2						

2 DAYS 21 HRS. 33 MIN. 52.000 SEC.

JULIAN DATE 2437959.47916666

OCT. 21, 1962 23 30 00.000

GEOCENTRIC

X	-.32076752	06	Y	.26081849	06	Z	.12727878	06	DX	-.18249315	C1	DY	-.39902500	00	DZ	-.14354839	C0
R	.43257135	06	CEC	.17111829	02	RA	.14088517	03	V	.18735533	C1	PTH	.38C55305	02	AZ	.98001562	02
R	.43257134	06	LAT	.17111829	02	LON	.11846149	C3	VE	.2871C3C6	C2	PTE	.23C53971	01	AZE	.26958984	C3
XS	-.13134715	09	YS	-.64317556	C8	ZS	-.27889603	08	DXS	.14504373	C2	DYS	-.24C20962	C2	DZS	-.10414866	02
XM	-.28859C11	06	YM	.24907751	06	ZM	.11544687	C6	DXM	-.70665511	CC	DYM	-.65552288	00	DZM	-.19115006	00
XT	-.28859C11	06	YT	.24907751	06	ZT	.11544687	C6	DXT	-.70665511	CC	DYT	-.65552288	00	DZT	-.19115006	00
RS	.14888469	09	VS	.25930836	02	RM	.35831123	C6	VM	.98265458	CC	RT	.39831123	06	VT	.98265458	CC
GEO	.17221566	02	ALT	.42619501	C6	LOS	.18366619	03	RAS	.20C08588	C3	RAM	.13920304	C3	LOM	.11677936	03
DLT	.34C0C0C0	C2	DT	.95999999	03	DR	.11548892	01	SHA	-.4C701954	C6	DES	-.10796628	C2	DEM	.16848428	02

HELIOCENTRIC

X	.131C2638	C9	Y	.7C393975	08	Z	.12964500	C5	DX	-.16329305	C2	DY	-.25872656	C2	DZ	-.26942943	00
R	.14873878	09	LAT	.45940648	-C2	LON	.28246930	02	V	.3C596148	C2	PTH	-.401C5607	C1	AZ	.89456312	02
XE	.13134715	09	YE	.7C1C4050	08	ZE	-.465C0000	02	DXE	-.14504373	C2	DYE	.26181637	02	DZE	-.10153055	-02
XT	.131C5856	C9	YT	.7C378497	C8	ZT	.678C0000	C4	DXT	-.15211C28	C2	DYT	.255C4176	02	DZT	.84400653	-C1
LTE	-.17894745	-04	LCE	.28090222	02	LTT	.26113598	-C2	LGT	.28235813	C2	RST	.14875980	C9	VST	.29695883	02
EPS	.10963481	03	ESP	.15670566	C0	SEP	.7C2C8402	02	EPM	.18221490	C2	EMP	.16C14829	03	MEP	.16302087	01
MPS	.12545238	C3	MSP	.27453512	-18	SMP	.54536249	C2	SEM	.71654C55	C2	EMS	.10820033	03	ESM	.14553811	CC
EPT	.18221490	C2	ETP	.16014829	03	TEP	.16302087	C1	TPS	.12545238	C3	TSP	.27453512	-18	STP	.54536249	C2
SET	.71654C55	02	STE	.1C820C33	C3	EST	.14553811	CC	RPM	.36238519	C5	RPT	.36238519	C5	SPN	.10878998	03
GCE	.10194576	03	GCT	.91681C33	C2	SIP	.12270342	C3	CPT	.89428312	C2	SIN	.86679351	02	D1	.144C4581	01
REP	.43257135	C6	VEP	.18735533	01	CPE	.1C007968	C3	CPS	.93344C14	C2	D2	.86670850	00	D3	.49268199	-C1

SELENOCENTRIC

X	-.32177410	05	Y	.11740977	05	Z	.11831907	05	DX	-.11182764	C1	DY	-.25649788	CC	DZ	-.33469845	C0
R	.36238519	C5	CEC	.19056527	C2	RA	.15995385	03	V	.11951386	C1	PTH	.82657356	C2	AZ	.11124566	03
R	.36238519	C5	LAT	.1C62358C	02	LON	.2C397816	C3	VR	.11867632	C1	PTR	.87191453	02	AZR	.83718501	02
LTS	.15355179	01	LNS	.25814C56	03	LTE	-.13382586	C1	LNE	.6315C323	C1						
ALT	.34500519	05	SHA	-.29515649	05	ALP	.17290979	03	DR	.11853380	C1	DP	.24149618	-C3	ASD	.27489598	01
HGE	.25C36518	03	SVL	.83464569	01	HNG	.23410969	03	SIA	.15472530	C2						

2 DAYS 22 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437959.50000000

OCT. 22, 1962 CC CC 00.000

CASE 1

SPACE TRAJECTORIES

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RA-5 PCSTMIDCOURSE ORBIT

GEOCENTRIC

EQUATORIAL COORDINATES

X	-32404464	06	Y	.26009623	06	Z	.12753423	06	DX	-.18164155	C1	DY	-.40342137	00	DZ	.14033211	00
R	.43464924	06	DEC	.17062741	02	RA	.14124753	03	V	.18659601	C1	PTH	.38201407	02	AZ	.98130782	02
R	.43464923	06	LAT	.17062741	02	LON	.11130327	03	VE	.28872235	C1	PTE	.22905987	01	AZE	.26958811	03
XS	-.13132103	09	YS	-.64360791	08	ZS	-.27908349	08	DXS	.14513520	C2	DYS	-.24016339	C2	DZS	-.10412962	C2
XM	-.28985511	06	YM	.24789497	06	ZM	.11510160	06	DXM	-.70333501	CC	DYM	-.65840796	CC	DZM	-.19248808	CC
XT	-.28985511	06	YT	.24789497	06	ZT	.11510160	06	DXT	-.70333501	CC	DYT	-.65840796	CC	DZT	-.19248808	CC
RS	.14888385	09	VS	.29931058	02	RM	.39839502	06	VM	.98246264	CC	RT	.39839502	06	VT	.98246264	CC
GED	.17172202	C2	ALT	.42827289	06	LOS	.17616533	03	RAS	.20610559	C3	RAM	.13546208	C3	LCM	.10951781	03
DLT	.34000000	02	DT	.95999999	03	DR	.11539615	C1	SHA	-.40813820	C6	DES	-.10804035	02	DEM	.16792903	02

HELIOCENTRIC

ECLIPTIC COORDINATES

X	.13099699	C9	Y	.70440538	08	Z	.13484250	05	DX	-.16330336	C2	DY	.25862305	02	DZ	.28822863	00
R	.14873493	C9	LAT	.51944124	-02	LON	.28268091	C2	V	.30587534	C2	PTH	-.40013835	C1	AZ	.89458413	02
XE	.13132103	09	YE	.70151174	08	ZE	-.48500000	C2	DXE	-.14513920	C2	DYE	.26176599	C2	DZE	-.10142326	-01
XT	.13103117	09	YT	.70424398	08	ZT	.69320000	04	DXT	-.15217255	C2	DYT	.25495959	02	DZT	.84321856	-01
LTE	-.18664517	-04	LOE	.28110954	02	LTT	.26699467	-02	LOT	.28256379	C2	RST	.14875740	09	VST	.29692017	C2
EPS	.10995750	03	ESP	.15686166	00	SEP	.69885278	C2	EPM	.18260781	C2	EMP	.16000996	03	MEP	.17292532	C1
MPS	.12583767	03	MSP	.98911702	-02	SMP	.54150348	02	SEM	.71421761	C2	ENS	.10843278	C3	ESM	.14536996	00
EPT	.18260781	02	ETP	.16000996	03	TEP	.17292532	01	TPS	.12583767	C3	TSP	.98911702	-02	STP	.54150348	02
SET	.71421761	02	STE	.10843278	03	EST	.14536996	CC	RPM	.38367850	C5	RPT	.38367850	05	SPN	.10911671	C3
GCE	.10187630	03	GCT	.91611537	02	SIP	.12324138	C3	CPT	.89344408	02	SIN	.86748117	02	C1	.13603467	C1
REP	.43464924	06	VEP	.18659601	C1	CPE	.99972270	02	CPS	.93348859	C2	D2	.82621944	CC	D3	.44569769	-01

SELENOCENTRIC

EQUATORIAL COORDINATES

X	-.34185532	C5	Y	.12201268	05	Z	.12432634	C5	DX	-.11130805	C1	DY	.25498660	00	DZ	.33282019	CC
R	.38367850	05	DEC	.18907291	02	RA	.16035784	C3	V	.11894266	C1	PTH	.83048161	02	AZ	.11143226	C3
R	.38367844	05	LAT	.10640291	02	LON	.20412057	03	VR	.11814959	C1	PTR	.87873263	02	AZR	.82575919	02
LTS	.15350809	C1	LNS	.25788661	C3	LTE	-.13668258	01	LNE	.62930715	C1						
ALT	.36629850	C5	SHA	-.31099313	05	ALP	.17280239	03	DR	.11806823	C1	DP	.21498230	-03	ASD	.25962906	C1
HGE	.25004249	03	SVL	.83060494	01	HNG	.23372244	C3	SIA	.15664490	C2						

5 DAYS 11 HRS. 55 MIN. 52.000 SEC.

JULIAN DATE 2437962.07777777

OCT. 24, 1962 13 52 00.000

RECTIFICATION

.16260057 05 -.59709147 04 -.58317370 04

15 DAYS 22 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2437976.50000000

NOV. 8, 1962 00 00 00.000

GEOCENTRIC

EQUATORIAL COORDINATES

X	-.22859175	C7	Y	-.59476698	06	Z	.12098452	06	DX	-.12436209	C1	DY	-.63197976	00	DZ	-.55525853	-C1
R	.23651224	C7	DEC	.29321635	01	RA	.19458427	C3	V	.13960925	C1	PTH	.76595502	02	AZ	.11275022	03
R	.23651224	C7	LAT	.29321635	01	LON	.14788414	C3	VE	.17194858	C3	PTE	.45252991	CC	AZE	.26995829	03
XS	-.10460943	09	YS	-.96332643	08	ZS	-.41772475	08	DXS	.21590109	C2	DYS	-.19179855	02	DZS	-.83176409	01
XM	.35899962	06	YM	-.46619588	05	ZM	-.45810300	05	DXM	.13342550	CC	DYM	.10015464	01	DZM	.36753930	CC
XT	.35899962	06	YT	-.46619588	05	ZT	-.45810300	05	DXT	.13342550	CC	DYT	.10015464	01	DZT	.36753930	CC
RS	.14821623	C9	VS	.30053000	02	RM	.36490094	C6	VM	.12751668	C1	RT	.36490094	C6	VT	.10751668	01
GED	.29521103	C1	ALT	.23587442	07	LOS	.17594119	03	RAS	.22260432	C3	RAM	.35260099	03	LCM	.30590085	03
DLT	.34000000	02	DT	.30720000	05	DR	.13580598	01	SHA	-.13150117	C7	DES	-.16369734	02	DEM	-.72120428	01

SPACE TRAJECTORIES

CASE 1

RA-5 PCSTMICCOURSE ORBIT

GEOCENTRIC

EPOCH OF PERICENTER PASSAGE
 SMA -24727144 06
 VH -12696482 01
 TA -98257234 02
 WY -14303001 00
 CX -98709214 00
 SXO -88592321 00
 BX -44122825 00
 B.T -55580368 C6
 C3J -30595385 01

ECC -26353005 01
 C3 -16120066 01
 EA -11835901 C3
 WY -36237551 00
 QY -11997519 00
 SYO -46173161 C0
 BY -80962215 00
 E.R -23359540 06

INC -22928414 C2
 C1 -76546670 C6
 MA -10783012 C3
 WZ -9209232 C0
 QZ -10608962 C0
 SZO -44090076-01
 BZ -38707828 C0
 B -60289679 C6

JULIAN DATE 2437972.25776955
 LAN -21539205 C2
 SLR -14699814 C7
 DAC -25262932 C1
 PX -72052229-C1
 RX -39098443-C1
 TX -46218106 C0
 MX -21308688 C0
 PER -00000000 C0

ORBITAL E.T AND B.R
 APF -74197808 C2
 APC -00000000 00
 RAO -20752793 C3
 PY -52427827 C0
 RY -20377598-C1
 TY -88678558 C0
 MY -89746597 C0
 QMD -12569685-05

EQUATORIAL COORDINATES
 NOV. 3, 1962
 RCA -40436310 06
 TFP -36652871 06
 MTA -11230045 03
 PZ -37405808 C0
 RZ -59902754 C0
 TZ -00000000 C0
 WZ -38620836 C0
 NCD -714355381-06

HELIOCENTRIC

X -10232351 C9
 R -14625629 C9
 YE -10460943 09
 XT -10496843 C9
 LIE -13317297-C3
 EPS -14570511 03
 MPS -14300516 03
 EPT -29334318 01
 SET -12516661 C3
 GCE -86861405 C2
 REP -23651224 C7

Y -10450206 C9
 LAT -13631521 00
 YE -10459961 C9
 YT -10493861 09
 LCE -45106651 C2
 ESP -51515036 00
 MSP -62861796 C0
 ETP -19371919 02
 STE -54718235 02
 GCT -88830759 02
 VEP -13960925 01

Z -34796050 C6
 LON -45603472 C2
 ZE -34450000 C3
 ZT -23137500 05
 LTT -89315541-C2
 SEP -33779728 C2
 SMP -36366199 02
 TEP -15769463 03
 EST -11513766 C0
 SIP -14296836 C3
 CPE -82336237 C2

DX -22833729 C2
 V -30555939 C2
 DXE -21590109 C2
 DXT -21456679 C2
 LCT -44991859 C2
 EPM -29334318 C1
 SEM -12516661 C3
 TPS -14300516 C3
 RPM -27062654 C7
 CPT -83597189 C2
 CPS -97144445 C2

DY -20303836 02
 PTH -27519301 01
 DYE -20905741 C2
 DYT -21970837 C2
 RST -14842269 09
 EMP -19371919 02
 EMS -54718235 C2
 TSP -62861796 C0
 RPT -27062654 07
 SIN -83560391 02
 C2 -15520060-C1

ECLIPTIC COORDINATES
 C2 -20121688 C0
 AZ -89615704 C2
 DZE -73802470-03
 DZI -60500664-C1
 VST -30710102 C2
 MEP -15765463 C3
 ESM -11513766 00
 STP -36366199 02
 SPN -14555060 C3
 C1 -19266407-C1
 D3 -16803214-04

HELIOCENTRIC

EPOCH OF PERICENTER PASSAGE
 SMA -15061302 C9
 VH -28065198 02
 TA -61712644 C2
 WY -31279418-C2
 CX -95467214 C0
 SXI -29763993 00
 BX -95467299 C0
 B.T -15037614 C9

ECC -56035325-01
 C3 -88116844 C3
 EA -58920886 C2
 WY -63923490-02
 QY -29765441 C0
 SVI -95465135 C0
 BY -29765468 00
 E.R -16293300 06

INC -40770429 C0
 C1 -44638446 10
 MA -56171162 02
 WZ -99997468 C0
 QZ -10834754-C2
 SZI -70336431-02
 BZ -10834764-02
 E -15037623 C9

JULIAN DATE 2438034.07183666
 LAN -26073658 C2
 SLR -15014010 C9
 DAI -40300165 C0
 PX -29763953 C0
 RX -20935467-C2
 TX -95467582 C0
 MX -71451040 C0
 PER -36897689 C3

ORBITAL E.T AND B.R
 APF -81242877 02
 APO -15905266 C9
 RAI -10731636 03
 PY -95465135 00
 RY -67148490-C2
 TY -29764756 C0
 MY -69959269 C0
 DEF

EQUATORIAL COORDINATES
 JAN. 4, 1963
 RCA -14217336 09
 TFP -49742067 07
 MTA -18000000 03
 PZ -70336431-02
 RZ -99997495 00
 TZ -00000000 00
 WZ -67071573-02
 C3J

32 DAYS 22 HRS. 3 MIN. 52.000 SEC.

GEOCENTRIC

X -37088180 C7
 R -39698218 C7
 R -39698234 C7
 XS -37891151 08
 XM -39592500 C6
 XT -39592500 C6
 RS -14778876 C9
 GED -79543196-01
 DLT -34000000 C2

Y -14156710 07
 DEC -78999674-01
 LAT -79004797-01
 VS -11522974 09
 YM -55116000 C6
 YT -55116000 05
 VS -30151566 C2
 ALT -39634436 07
 DT -86339999 05

Z -54735000 C4
 RA -20089206 C3
 LON -14137848 C3
 ZS -449965918 08
 ZM -54181000 C5
 ZT -54181000 C5
 RM -40356397 06
 LOS -17642914 C3
 DR -14968279 C1

DX -12764642 C1
 V -15456709 C1
 VE -28914646 C3
 DXS -25799910 C2
 DXM -15972444 C0
 DXT -19972444 C0
 VM -96827196 C0
 RAS -23594272 C3
 SHA -25285878 C7

DY -85252845 00
 PTH -75557891 02
 PTE -29660523 C0
 DYS -14316229 C2
 DYM -89125359 C0
 DYT -89125359 C0
 RT -40396397 C6
 RAM -17150784 03
 DES -19760554 02

EQUATORIAL COORDINATES
 NOV. 21, 1962
 C2 -18133283 00
 AZ -11771276 03
 AZE -26996447 03
 DZS -62070252 01
 DZM -32144642 C0
 DZI -32144642 C0
 VT -96827196 00
 LOM -11199425 03
 DEM -77079315 C1

CASE 1

SPACE TRAJECTORIES

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RA-5 PCSTMIDCOURSE ORBIT

HELIOCENTRIC

X	.74182333	08	Y	.12429552	09	Z	.55791149	06	DX	-.27076394	C2	DY	-.14749597	C2	DZ	.17205024	00
R	.14475050	09	LAT	.22083624	00	LON	.59170308	02	V	.30833607	C2	PTH	-.22455057	01	AZ	.89671365	02
XE	.77891151	08	YE	.12599652	09	ZE	-.26400000	03	DXE	-.25799510	C2	DYE	.15603896	02	DZE	-.74642896	-03
XT	.77495226	08	YT	.12567231	09	ZT	.25926000	05	DXT	-.25999634	C2	DYT	.14658326	02	DZT	.58907866	-01
LTE	-.10234536	-03	LOE	.58194066	02	LTT	.10060960	-01	LCT	.58340141	C2	RST	.14764498	09	VST	.29847127	02
EPS	.13943412	03	ESP	.10009288	01	SEP	.39564549	02	EPM	.32226244	C1	EMP	.14646543	03	MEP	.30311952	02
MPS	.14251655	03	MSP	.85657589	00	SMP	.36626943	02	SEM	.69077197	C2	EMS	.11077637	03	ESM	.14637599	00
ETP	.32226244	01	ETP	.14646543	03	TEP	.30311952	02	TPS	.14251655	C3	TSP	.85657989	00	STP	.36626943	C2
SET	.69077197	02	STE	.14637599	03	EST	.14637599	00	RPM	.36268189	C7	RPT	.36268189	C7	SPN	.13934206	03
GCE	.87412909	02	GCT	.85918780	C2	SIP	.14248909	03	CPT	.79837685	C2	SIN	.79810227	C2	D1	.14376236	-01
REP	.39698218	07	VEP	.15456709	01	CPE	.80968767	02	CPS	.99703381	C2	D2	.11540760	-01	D3	.92672163	-05

62 DAYS 22 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2438019.50000000

DEC. 21, 1962 00 00 00.000

GEOCENTRIC

EQUATORIAL COORDINATES

X	-.68129395	07	Y	-.46061700	07	Z	-.10229940	07	DX	-.97450829	CC	DY	-.16818810	01	DZ	-.64097070	00
R	.82873064	07	DEC	-.70907403	01	RA	.21406229	03	V	.20467617	C1	PTH	.62473676	02	AZ	.11636886	C3
R	.82873064	07	LAT	-.70907403	01	LON	.12497913	03	VE	.59885351	C3	PTE	.17365927	00	AZE	.26995980	C3
XS	-.35015344	07	YS	-.13498419	09	ZS	-.58531621	08	DXS	.30271261	C2	DYS	-.56091802	CC	DZS	-.24302874	00
XM	-.37629950	06	YM	-.14636600	06	ZM	-.23981000	05	DXM	.35389304	CC	DYM	-.83091859	00	DZM	-.34579959	00
XT	-.37629950	06	YT	-.14636600	06	ZT	-.23981000	05	DXT	.35389304	CC	DYT	-.83091859	00	DZT	-.34579959	00
RS	.14716577	09	VS	.30277433	02	RM	.40447423	06	VM	.96707580	CC	RT	.40447423	C6	VT	.96707580	CC
GED	-.71385601	C1	ALT	.82809285	C7	LDS	.17943088	03	RAS	.26851406	C3	RAM	.20125411	C3	LOM	.11217094	03
DLT	.34000000	02	DT	.17280000	06	DR	.18150655	01	SHA	-.67601423	C7	DES	-.23435408	02	DEM	-.33990205	01

HELIOCENTRIC

EQUATORIAL COORDINATES

X	-.33114041	07	Y	.14249516	09	Z	.89349599	06	DX	-.31245770	C2	DY	-.11867510	C1	DZ	.80857459	-01
R	.14253643	09	LAT	.35916549	00	LON	.91331241	02	V	.31268403	C2	PTH	-.84292644	00	AZ	.89846533	02
XE	.35015344	07	YE	.14712811	09	ZE	-.41850000	03	DXE	-.30271261	C2	DYE	.61130348	00	DZE	-.18119626	-03
XT	.31252348	07	YT	.14698429	09	ZT	.35809000	03	DXT	-.29917368	C2	DYT	-.28859982	00	DZT	.13126328	-01
LTE	-.16292940	-03	LOE	.88636659	02	LTT	.13955511	-01	LCT	.88781937	C2	RST	.14701751	09	VST	.29918763	02
EPS	.12262272	03	ESP	.27184108	01	SEP	.54658864	02	EPM	.67412905	CC	EMP	.16605016	03	MEP	.13275685	02
MPS	.12328978	03	MSP	.25725479	01	SMP	.54137662	02	SEM	.67813645	C2	EMS	.11204039	C3	ESM	.14620880	00
EPT	.67412505	00	ETP	.16605016	03	TEP	.13275685	C2	TPS	.12328978	C3	TSP	.25725479	01	STP	.54137662	02
SET	.67813645	02	STE	.11204039	03	EST	.14620880	CC	RPM	.78941876	C7	RPT	.78941876	07	SPN	.12257863	03
GCE	.85683756	02	GCT	.85567551	02	SIP	.12327717	03	CPT	.79025842	C2	SIN	.79013226	02	D1	.66048595	-02
REP	.82873064	07	VEP	.20467617	C1	CPE	.79227149	02	CPS	.10343564	C3	D2	.38700798	-02	D3	.10511651	-05

92 DAYS 22 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2438049.50000000

JAN. 20, 1963 00 00 00.000

GEOCENTRIC

EQUATORIAL COORDINATES

X	-.78561860	07	Y	-.99051560	07	Z	-.32521580	07	DX	-.34487462	CC	DY	-.22886691	01	DZ	-.10293047	C1
R	.13054053	08	DEC	-.14426043	02	RA	.23158061	03	V	.25330639	C1	PTH	.44818860	02	AZ	.10962635	03
R	.13054053	08	LAT	-.14426042	02	LON	.11292781	03	VE	.92021209	C3	PTE	.11117072	00	AZE	.26996241	03
XS	.71823023	08	YS	-.11788523	09	ZS	-.51117419	08	DXS	.26498251	C2	DYS	.13428426	02	DZS	.58223936	01
XM	-.24142000	06	YM	-.30426800	06	ZM	-.94956999	05	DXM	.79909205	CC	DYM	-.50265706	00	DZM	-.25980955	00
XT	-.24142000	06	YT	-.30426800	06	ZT	-.94956999	05	DXT	.79909205	CC	DYT	-.50265706	00	DZT	-.25980955	00
RS	.14720213	09	VS	.30271772	02	RM	.39984930	C6	VM	.97513502	CC	RT	.39984930	C6	VT	.97513502	00
GED	-.14520210	02	ALT	.13047676	08	LDS	.18269955	03	RAS	.30135237	C3	RAM	.23156992	03	LOM	.11291710	03
DLT	.34000000	02	DT	.17280000	06	DR	.17854751	01	SHA	-.11961196	C8	DES	-.20319819	02	DEM	-.13737972	02

CASE 1

RA-5 POSTMIDCOURSE ORBIT

HELIOCENTRIC

X -.79679208 08 Y .11810955 09 Z .95646150 C6 DX -.26153376 C2 DY -.17145604 02 DZ -.33385634-C1
 R .14247651 09 LAT .38463612 00 LON .12400444 03 V .31272542 C2 PTH .75600290 CC AZ .90066250 C2
 XE -.71823023 08 YE .12849093 09 ZE -.40600000 03 DXE -.26498251 C2 DYE -.14636355 02 DZE .35293569-03
 XT -.72064442 08 YT .12817400 09 ZT .33522500 05 DXT -.25699158 C2 DYT -.15200883 02 DYT -.37938416-01
 LTE -.15802819-03 LOE .11920403 03 LTT .13062085-C1 LCT .11934640 C3 RST .14704373 09 VST .29858249 C2
 EPS .10879575 C3 ESP .48157610 01 SEP .66388476 02 EPM .23196850-C1 EMP .17929010 C3 MEP .68813393 00
 MPS .10880213 03 MSP .46727921 01 SMP .66591587 C2 SEM .11326503 03 ESM .14333671 C0
 EPT .23196850-01 ETP .17929010 03 TEP .68813393 00 TPS .10880213 C3 TSP .46727921 01 STP .66525067 C2
 SET .66591587 C2 STE .11326503 03 EST .14333671 C0 RPM .12654234 08 RPT .12654234 08 SPN .10876776 C3
 GCE .80603649 C2 GCT .80625608 02 SIP .10876776 C0 CPT .77142794 C2 SIN .77134924 C2 D1 .41203602-02
 REP .13054053 08 VEP .25330639 C1 CPE .77123346 02 CPS .10295470 C3 D2 .16415433-02 D3 .24577132-06

122 DAYS 22 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2438079.50000000

FEB. 19, 1963 CC CC CC 00.000

GEOCENTRIC

X -.46785260 07 Y -.15390887 08 Z -.587611365 07 DX -.20865162 C1 DY -.17179470 C1 DZ -.89301348 C0
 R .17125916 08 CEC -.20066691 02 RA .25309176 03 V .28464653 C1 PTH .26730038 02 AZ .10095311 C3
 R .17125916 08 LAT -.20066690 C2 LON .10486953 03 VE .11705339 C4 PTE .62669546-01 AZE .26997635 C3
 XS .12757452 09 YS -.68610829 08 ZS -.29751295 08 DXS .15562702 C2 DYS .23677162 C2 DZS .10266053 C2
 XM -.32467000 05 YM -.36499900 06 ZM -.13645775 06 DXM .99914908 C0 DYM .82495212-02 DZM -.82017898-01
 XT -.32467000 05 YT -.36499900 06 ZT -.13645775 06 DXT .99914908 C0 DYT .82495212-02 DZT -.82017898-01
 RS .14787780 C9 VS .30136216 C2 RM .39102313 06 VM .10025437 C1 RT .39102313 06 VT .10025437 C1
 GED -.20192427 02 ALT .17119540 C8 LOS .18350597 C3 RAS .33172820 C3 RAM .26491686 C3 LOM .11669464 C3
 DLT .34000000 C2 DT .17280000 06 DR .12803039 01 SHA -.16580685 C8 DES -.11606460 C2 DEM -.20424704 02

HELIOCENTRIC

X -.13225305 C9 Y .58325380 C8 Z .73167749 C6 DX -.13476186 C2 DY -.27738386 02 DZ -.13490152 C0
 R .14454499 C9 LAT .29002861 00 LON .15620187 C3 V .30838999 C2 PTH .21125032 01 AZ .90261505 02
 XE -.12757452 C9 YE .74783589 08 ZE -.25325000 03 DXE -.15562702 C2 DYE -.25806972 02 DZE .94056129-03
 XT -.12760699 C9 YT .74394431 08 ZT .19762000 05 DXT -.14563553 C2 DYT -.25832033 02 DYT -.77589273-01
 LTE -.98122608-C4 LOE .14962137 03 LTT .76655848-C2 LCT .14975756 C3 RST .14770943 09 VST .29654629 C2
 EPS .97909517 02 ESP .65868600 01 SEP .75503612 C2 EPM .25745581 C0 EMP .16864452 C3 ESM .11097897 02
 MPS .97652389 02 MSP .64500549 01 SMP .75857345 02 SEM .64426424 C2 TSP .64500549 01 STP .75897545 02
 EPT .25745581 00 ETP .16864452 03 TEP .11097897 02 TPS .97652389 C2 RPM .16742374 08 RPT .16742374 08 SPN .97888178 C2
 SET .64426424 C2 STE .11543676 03 EST .13669873 C0 SIP .75414679 C2 SIN .75408731 02 D1 .31142536-02
 GCE .76278450 C2 GCT .76293818 02 SIP .75414679 C2 CPS .98432384 C2 D2 .75888483-03 D3 .81218529-07
 REP .17125916 08 VEP .28464653 C1 CPE .75366938 C2 CPS .98432384 C2

152 DAYS 22 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2438109.50000000

MARCH 21, 1963 CC 00 CC 00.000

GEOCENTRIC

X .21027560 07 Y .17827058 08 Z -.74086462 07 DX .29265041 C1 DY -.45620679-C1 DZ -.23154283 00
 R .19419417 08 CEC -.22427068 02 RA .27672726 03 V .29360040 C1 PTH .87593077 01 AZ .91302449 02
 R .19419417 08 LAT -.22427069 02 LON .58935889 02 VE .13060808 C4 PTE .19615449-01 AZE .26999709 C3
 XS .14900538 C9 YS -.80900845 06 ZS -.35078198 06 DXS .67276691 C0 DYS .27435205 02 DZS .11895554 C2
 XM .18559000 06 YM -.30371588 06 ZM -.13271467 06 DXM .85987824 C0 DYM .55475903 C0 DZM .14120042 00
 XT .18559000 06 YT -.30371588 06 ZT -.13271467 06 DXT .85987824 C0 DYT .55475903 00 DZT .14120042 00
 RS .14900799 C9 VS .25910655 02 RM .37986862 06 VM .10329984 C1 RT .37986862 06 VT .10329984 C1
 GED -.22564629 02 ALT .19413042 08 LCS .18189155 03 RAS .35968892 C3 RAM .30142762 C3 LCM .12363625 03
 DLT .34000000 C2 DT .17280000 06 DR .44710622 C0 SHA -.19292452 C8 DES -.13488172 C0 DEM -.20448781 02

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SPACE TRAJECTORIES

CASE 1

RA-5 POSTMIDCOURSE ORBIT

HELIOCENTRIC

X	-14690259	09	Y	-18421193	08	Z	.29513256	06	DX	.22537372	C1	DT	-.30037059	02	DZ	-.19318378	00
R	-14805336	09	LAT	.11421613	00	LON	.18714743	C3	V	.30122111	C2	PTH	-.28556628	C1	AZ	.90373613	C2
XE	-14900338	09	YE	.88178379	06	ZE	-.26589844	C2	DXE	-.67276691	CC	DVE	-.29903088	C2	DZE	.10969639	-02
XT	-14881579	09	YT	.55033899	06	LT	-.95699999	03	DXT	.18711134	C0	DVT	-.29337946	02	DZT	-.90061545	-01
LTE	-10224188	-04	LOE	.17966094	03	LTT	-.36844349	-03	LOT	.17978812	C3	RST	.14882081	09	VST	.29338681	02
EPS	.89068019	C2	ESP	.74873609	C1	SEP	.83444620	C2	EPM	.44685877	CC	EMP	.15650247	03	MEP	.23050659	C2
MPS	.88621512	C2	MSP	.73601572	01	SMP	.84018287	02	SEM	.60414711	C2	EKS	.11945810	C3	ESM	.12705441	00
EPT	.44685877	00	ETP	.15650247	03	TEP	.23050659	C2	TPS	.88621512	C2	TSP	.73601972	01	STP	.84018287	02
SET	.60414711	C2	STE	.11945810	C3	EST	.12705441	CC	RPM	.19070458	C8	RPT	.19070458	08	SPN	.89049200	02
GCE	.75070792	C2	GCT	.75052807	C2	SIP	.88616290	C2	CPT	.75105365	C2	SIN	.75105365	C2	D1	.27340717	-02
REP	.19419417	08	VEP	.29360040	01	CPE	.75107455	C2	CPS	.91672063	C2	D2	.28494629	-03	D3	.26108588	-07

182 DAYS 22 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2438139.50000000

APRIL 20, 1963 00 00 CO.000

GEOCENTRIC

EQUATORIAL COORDINATES

X	.90916149	07	Y	-.15641205	08	Z	-.70252474	C7	DX	.22424191	C1	DT	-.16504278	01	DZ	-.49972093	CC
R	.19407701	08	DEC	-.21221995	02	RA	.30016774	03	V	.28287941	C1	PTH	-.93698250	C1	AZ	.82646316	02
R	.19407700	08	LAT	-.21221997	02	LON	.52807288	02	VE	.13164897	C4	PTE	-.20045751	-C1	AZE	.27001555	03
XS	.13117766	C9	YS	.67283399	08	ZS	-.29175955	08	DXS	-.14045479	C2	DYS	.23965001	02	DZS	.10391087	C2
XH	.33511200	06	YH	-.13260800	06	ZH	-.80528500	C5	DXH	.37833965	CC	DYH	.93586278	00	DZH	.33318596	CC
XT	.33511200	06	YT	-.13260800	06	ZT	-.80528500	05	DXT	.37833965	CC	DYT	.93586278	00	DZT	.33318596	CC
RS	.15028596	09	VS	.29657570	02	RM	-.36928278	C6	VM	.10630125	C1	RT	.36928278	C6	VT	.10630125	01
ALT	.19401325	08	LOS	.19401325	08	RAS	.27154108	C2	RAS	.27154108	C2	RAM	.33841067	03	LCM	.13105021	03
GUT	.34000000	C2	DT	.17280000	C6	DR	-.46054561	CC	SHA	.19402919	08	DES	.11194271	02	DEM	-.12595541	C2

HELIOCENTRIC

ECLIPTIC COORDINATES

X	-.12208605	09	Y	-.90481862	08	Z	-.22250850	C6	DX	.16287898	C2	DT	-.24407793	02	DZ	-.19732344	00
R	.15196058	09	LAT	-.83896065	-01	LON	.21654332	C3	V	.29344078	C2	PTH	-.28277000	01	AZ	.90381610	C2
XE	-.13108425	09	YE	.73336840	C8	ZE	.19175000	C3	DXE	.14045479	C2	DVE	-.26120795	C2	DZE	.80633163	-03
XT	-.13084255	09	YT	.73490539	08	ZT	-.20933000	05	DXT	.14423819	C2	DVT	-.25129627	C2	DZT	-.65827607	-01
LTE	.73103736	-04	LOE	.20920802	03	LTT	-.75921532	-02	LOT	.20932168	C3	RST	.15006876	09	VST	.28974972	02
EPS	.81392269	C2	ESP	.73357782	01	SEP	.91271953	C2	EPM	.67369352	CC	EMP	.14183529	03	MEP	.37491029	02
MPS	.80720688	C2	MSP	.72220378	01	SMP	.92057271	C2	SEM	.53915120	C2	EKS	.12597094	03	ESM	.11364091	00
EPT	.67369352	00	ETP	.14183529	C3	TEP	.37491029	C2	TPS	.80720688	C2	TSP	.72220378	01	STP	.92057271	02
SET	.53915120	02	STE	.12597094	03	EST	.11364091	CC	RPM	.19116015	C8	RPT	.19116015	08	SPN	.81373437	02
GCE	.77485618	C2	GCT	.77432042	02	SIP	.80715478	C2	CPT	.76752108	C2	SIN	.76786898	C2	C1	.27275559	-02
REP	.19407701	08	VEP	.28287941	01	CPE	.76883726	C2	CPS	.84798141	C2	D2	.97923884	-04	D3	.89080285	-08

212 DAYS 22 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2438169.50000000

MAY 20, 1963 00 00 CO.000

GEOCENTRIC

EQUATORIAL COORDINATES

X	.12858863	08	Y	-.10197149	08	Z	-.51700245	C7	DX	.59277105	CC	DT	-.23635157	01	DZ	-.85741550	CC
R	.17206433	08	DEC	-.17485859	02	RA	.32158539	03	V	.25831658	C1	PTH	-.28065695	C2	AZ	.76913942	02
R	.17206433	08	LAT	-.17485859	02	LON	.84655629	C2	VE	.11945145	04	PTE	-.58295663	-01	AZE	.27002475	03
XS	.79584570	C8	YS	.11814162	C9	ZS	.51229326	08	DXS	-.24485712	C2	DYS	.14478174	02	DZS	.62780137	C1
XH	.35127600	C6	YH	.90453999	05	ZH	.44365000	04	CXH	-.29360036	CC	DYH	.96003687	CC	DZH	.40498602	CC
XT	.35127600	C6	YT	.90453999	05	ZT	.44365000	04	DXT	-.29360036	CC	DYT	.96003687	CC	DZT	.40498602	CC
RS	.15137917	09	VS	.29442947	02	RM	.36276223	C6	VM	.10825367	C1	RT	.36276223	06	VT	.10825367	01
GCE	-.17597690	C2	ALT	.17200057	08	LOS	.17910444	C3	RAS	.56034199	C2	RAM	.14440028	02	LCM	.13751027	C3
GUT	.34000000	C2	DT	.17280000	C6	DR	-.12153372	C1	SHA	.16952094	C8	DES	.19780473	C2	DEM	.70073130	CC

SPACE TRAJECTORIES

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RA-5 POSTMIDCOURSE ORBIT

HELIOCENTRIC

X	-66726107	08	Y	-14C18293	C9	Z	-68617300	06	DX	-25449483	C2	DY	-13271182	C2	DZ	-15351617	00
R	15525495	C9	LAT	-25322926	00	LON	24454587	C3	V	28702335	C2	PTH	20879384	01	AZ	90297424	02
XE	7558497C	08	YE	-12877067	C9	ZE	30700000	C3	DXE	24856712	C2	DYE	-15780715	C2	DZE	13393163	-03
XT	-79233694	08	YT	-12868592	C9	ZT	-31608000	C5	DXT	24563112	C2	DYT	-14738805	C2	DZT	-10246217	-01
LTE	11619699	-03	LCE	23828242	C3	LTT	-11983679	-01	LOT	23837882	C3	RST	15112261	C9	VST	28645749	02
EPS	73867856	C2	ESP	62685519	C1	SEP	59863590	02	EPM	10026135	C1	EMS	12350244	03	MEP	55094908	02
MPS	72867866	C2	MSP	61717519	01	SMP	10096038	C3	SEM	44941787	C3	ESM	13496106	03	ESM	97917601	-01
EPT	10026135	01	ETP	12390244	03	TEP	55094508	C2	TPS	72867866	C2	TSP	61717519	01	STP	10096038	03
SET	44941787	C2	STE	13496106	C3	EST	97517601	-01	RPM	17001457	C8	RPT	17001457	08	SPN	73846615	02
GCE	83113614	02	GCT	83037467	02	SIP	72862010	02	CPT	80332250	C2	SIN	80326393	02	D1	30667959	-02
REP	17206433	08	VEP	25831658	C1	CPE	80548365	C2	CPS	79425173	C2	D2	58314894	-03	D3	60714817	-07

242 DAYS 22 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2438195.50000000

JUNE 19, 1963 00 00 00.000

GEOCENTRIC

X	12288543	08	Y	-4481154C	C7	Z	-30220610	C7	DX	-94496250	CC	DY	18976039	01	DZ	74022833	C0
R	13424674	08	CEC	-13009488	C2	RA	33996505	C3	V	22453537	C1	PTH	-47862592	02	AZ	75584648	C2
R	13424674	08	LAT	-13009489	C2	LON	73465700	C2	VE	95235845	C3	PTE	-10017326	00	AZE	27002256	03
XS	79039901	07	YS	13927858	C9	ZS	60394824	08	DXS	-29271910	C2	DYS	15260613	C1	DZS	66241972	00
XM	21896806	C6	YM	2755080C	C6	ZM	88907500	C5	DXM	-86212182	CC	DYM	57879233	00	DZM	30860281	CC
XT	21896806	C6	YT	2755080C	C6	ZT	88907500	C5	DXT	-86212182	CC	DYT	57879233	00	DZT	30860281	CC
RS	15201490	C9	VS	29319147	C2	RM	36298238	C6	VM	10832776	C1	RT	36298238	C6	VT	10832776	01
GED	-13095101	02	ALT	13418297	08	LOS	18025262	03	RAS	86751574	C2	RAM	51523045	02	LOM	14502369	03
DLT	34000000	C2	DT	17280000	C6	DR	-16650447	C1	SHA	12587180	C8	DES	23409209	02	DEM	14178059	C2

HELIOCENTRIC

X	43845530	07	Y	-15712283	C9	Z	-58955800	06	DX	-28326948	C2	DY	37182941	C0	DZ	-76426699	-01
R	15718710	C9	LAT	-36071168	C0	LON	27159844	03	V	28329491	C2	PTH	84734984	00	AZ	90149255	02
XE	79039901	07	YE	-15180928	C9	ZE	27000000	C3	DXE	29271910	C2	DYE	-16636293	01	DZE	-62062960	-03
XT	-76850221	07	YT	-15152114	C9	ZT	-27768000	C5	DXT	28405788	C2	DYT	-10098392	01	DZT	52245139	-01
LTE	10176542	-03	LCE	26701956	C3	LTT	-10486634	-01	LOT	26709649	C3	RST	15171590	09	VST	28427778	02
EPS	65061820	C2	ESP	45930398	C1	SEP	11034515	03	EPM	15120670	C1	EMS	10259279	03	MEP	75895106	02
MPS	63550602	C2	MSP	45155207	C1	SMP	11193388	C3	SEM	34502526	C2	ESM	14541942	C3	ESM	78196572	-01
EPT	15120670	C1	ETP	10259279	C3	TEP	75895106	C2	TPS	63550602	C2	TSP	45155207	01	STP	11193388	03
SET	34502926	C2	STE	14541942	C3	EST	78156572	-01	RPM	13340862	C8	RPT	13340862	08	SPN	65034598	02
GCE	91285983	02	GCT	91228744	C2	SIP	63543138	02	CPT	85128631	C2	SIN	85121167	02	D1	39082932	-02
REP	13424674	08	VEP	22453937	01	CPE	85510750	C2	CPS	76551101	C2	D2	14600660	-02	D3	20503022	-06

272 DAYS 22 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2438225.50000000

JULY 19, 1963 00 00 00.000

GEOCENTRIC

X	87822519	C7	Y	-93753000	C6	Z	-15711615	07	DX	-16111827	C1	DY	80653405	00	DZ	36938357	00
R	89708507	C7	CEC	-10086849	02	RA	35390662	C3	V	18352528	C1	PTH	-69815784	02	AZ	83840650	C2
R	89708501	C7	LAT	-10086848	02	LON	57837573	02	VE	64342490	C3	PTE	-15372536	00	AZE	27000006	03
XS	85764808	08	YS	12576509	C9	ZS	54535413	08	DXS	-26383382	C2	DYS	-11724153	02	DZS	-50827619	01
XM	-86080000	C4	YM	34380400	C6	ZM	13688000	C6	DXM	-10605814	01	DYM	-33666134	-01	DZM	85401296	-01
XT	-86080000	C4	YT	34380400	C6	ZT	13688000	C6	DXT	-10605814	01	DYT	-33666134	-01	DZT	85401296	-01
RS	15203540	C9	VS	29315066	02	RM	37015054	06	VM	10645467	C1	RT	37015054	C6	VT	10645467	01
GED	-10154162	02	ALT	89644731	07	LOS	18153682	C3	RAS	11760587	C3	RAM	91434245	02	LOM	15536520	C3
DLT	34000000	C2	DT	17280000	C6	DR	-17263009	C1	SHA	73538076	07	DES	21019927	02	DEM	21703005	C2

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SPACE TRAJECTORIES

CASE 1

RA-5 PCST MIDCOURSE ORBIT

HELIOCENTRIC

X	.7454710C	C8	Y	-.13856536	C9	Z	-.10683825	O7	DX	.24772199	C2	DY	.13665421	O2	DZ	.16938448	-O1
R	.15736452	C9	LAT	-.38903476	O0	LON	.29827990	O3	V	.28291445	C2	PTH	-.60334475	C0	AZ	.89969787	O2
XE	.65764808	O8	YE	-.13708015	O9	ZE	.10600000	C3	DXE	.26383382	C2	DYE	.12778507	O2	DZE	-.10859370	-O2
XT	.65756200	C8	YT	-.13671027	O9	ZT	-.11090500	C5	DXT	.25322801	C2	DYT	.12781595	O2	DZT	.90659558	-C1
LTE	.39945512	-C4	LOE	.29562957	O3	LTT	-.41887234	-O2	LCT	.29568706	C3	RST	.15170226	O9	VST	.28365853	C2
EPS	.52380519	C2	ESP	.26787155	O1	SEP	.12494075	O3	EPH	.23046707	C1	EMP	.77057363	C2	MEP	.10063796	O3
MPS	.50076546	O2	PSP	.26212300	O1	SMP	.12730182	O3	SEM	.24354408	C2	EMS	.15558794	O3	ESM	.57614939	-O1
EPT	.23046707	C1	ETP	.77057363	O2	TEP	.10063796	C3	TPS	.50076546	C2	TSP	.26212300	O1	STP	.12730182	C3
SET	.24354408	O2	STE	.15558794	O3	EST	.57614939	-O1	RPM	.90464590	C7	RPT	.90464590	C7	SPN	.52339783	O2
GCE	.10179331	O3	GCT	.10188449	O3	SIP	.50065540	C2	CPT	.90305098	C2	SIN	.90294090	O2	D1	.57635556	-O2
REP	.89708507	O7	VEP	.18392528	O1	CPE	.50940463	O2	CPS	.76635930	C2	D2	.34933272	-O2	D3	.84358129	-O6

ECLIPTIC COORDINATES

277 DAYS 1 HRS. 32 MIN. 15.287 SEC.
 RECTIFICATION - .93751343 -O2

JULIAN DATE 2438233.64471357

JULY 23, 1963

C3 28 23.287

289 DAYS 22 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2438246.50000000

AUG. 5, 1963

C0 00 C0.000

GEOCENTRIC

X	.64413390	O7	Y	-.20273600	O6	Z	-.11821415	O7	DX	-.15404861	C1	DY	.23252583	C0	DZ	.17680549	O0
R	.65520537	O7	DEC	-.10394403	C2	RA	.35819725	O3	V	.15679372	C1	PTH	-.82232463	C2	AZ	.11976829	O3
R	.65520541	O7	LAT	-.10394401	O2	LON	.45372136	O2	VE	.46976109	C3	PTE	-.18948481	O0	AZE	.26998716	O3
XS	-.10130672	C9	YS	.10367421	O9	ZS	.44956386	C8	DXS	-.21683536	C2	DYS	-.18137615	O2	DZS	-.78662705	C1
XH	.22958000	O6	YH	-.27613300	O6	ZH	-.13060550	C6	DXH	.79192114	C0	DYH	.63939571	C0	DZH	.18010169	CC
XT	.22958000	O6	YT	-.27613300	O6	ZT	-.13060550	O6	DXT	.79192114	C0	DYT	.63939571	O0	DZT	.18010169	O0
RS	.15176452	O9	VS	.29343262	O2	RM	.38211805	O6	VM	.10336356	C1	RT	.38211805	O6	VT	.10336356	O1
GED	-.10463677	O2	ALT	.65456761	O7	LOS	.18151314	C3	RAS	.13433827	C3	RAM	.30974051	O3	LOM	.35691538	C3
DUT	.34000000	O2	DT	.17280000	O6	DR	-.15535508	C1	SHA	.44721719	C7	DES	.17230983	O2	DEM	-.19986186	O2

EQUATORIAL COORDINATES

HELIOCENTRIC

X	.10774806	O9	Y	-.11365815	O9	Z	-.10037865	O7	DX	.20143050	C2	DY	.20053632	O2	DZ	.70816933	-O1
R	.15661681	C9	LAT	-.36722170	O0	LON	.31347094	C3	V	.28423555	C2	PTH	-.14024846	O1	AZ	.89866190	C2
XE	.10130672	O9	YE	-.11300185	O9	ZE	.11900000	C3	DXE	.21683536	C2	DYE	.19769959	O2	DZE	.11098981	-O2
XT	.10130672	O9	YT	-.11307115	O9	ZT	-.98495000	O4	DXT	.22475457	C2	DYT	.20428227	O2	DZT	-.88031112	-O1
LTE	.44926163	-O4	LOE	.31187638	O3	LTT	-.37091880	-O2	LCT	.31186401	C3	RST	.15214509	O9	VST	.30372131	O2
EPS	.41407740	C2	ESP	.16363045	O1	SEP	.13695596	C3	EPH	.25656815	C1	EMP	.12586394	O3	MEP	.47570357	C2
MPS	.43668946	O2	PSP	.16475231	O1	SMP	.13438353	O3	SEM	.17484519	C3	EMS	.51418753	O1	ESM	.13988227	-O1
EPT	.25656815	O1	ETP	.16475231	O3	TEP	.47570357	O2	TPS	.43968946	C2	TSP	.16475231	O1	STP	.13438353	O3
SET	.17484519	O3	STE	.51418753	O1	EST	.13988227	-O1	RPM	.63005606	C7	RPT	.63005606	C7	SPN	.41351965	O2
GCE	.10994056	C3	GCT	-.10971672	O3	SIP	.43953140	C2	CPT	.94559876	C2	SIN	.94544069	O2	D1	.82754543	-C2
REP	.65520537	O7	VEP	.15679372	O1	CPE	.93711732	O2	CPS	.78002387	C2	D2	.57894728	-O2	D3	.22341696	-O5

ECLIPTIC COORDINATES

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SPACE TRAJECTORIES

CASE 1

RA-5 POSTWIDCOURSE ORBIT

HELIOCENTRIC

EPOCH	CF	PERICENTER	PASSAGE	INCL	JULIAN DATE	2438399.68904224	CRBITAL B.T AND B.R	ECLIPIC CCORINATES								
SMA	.14964250	C9	ECC	.52630144-01	INC	.39079587	CC	LAN	.23450232	C2	APF	.83709337	O2	RCA	.14176680	C9
VM	.28252384	C2	C3	-.88688327	C1	.44502652	1C	SLR	.14952280	C1	APD	.15751821	O9	TFF	-.13235533	O8
TA	.15368506	O3	EA	-.15231927	MA	-.15091845	O3	DAI	.38848579	CC	RAI	.10715943	C3	MTA	-.18000000	O3
W	.27145895	O2	WY	-.62579883	WZ	.59997674	CC	PR	-.29502376	CC	PR	.95546243	CC	PZ	.67802989	O2
CX	-.95548264	CC	CY	-.29503529	QZ	.74743316	-C3	TX	-.20004018	-C2	RY	.64784910	O2	RZ	-.99997374	CC
SXI	-.29502376	O0	SYI	.95546243	SZI	.67802989	-C2	TX	.95548753	CC	TY	.29503151	CC	TZ	.00000000	CC
BX	.95548756	O0	BY	-.29503625	BZ	-.74743350	-C3	MX	.72573169	CC	MY	.68797387	CC	MZ	.23353232	-O2
B.T	.14943458	C9	P.R	.11169495	B	.14943462	O9	PER	.36541625	C3	DEF			C3J		

305 DAYS 22 HRS. 3 MIN. 52.000 SEC.

GEOCENTRIC

X	Y	Z	DX	DY	PTH	PTX	PTE	DYS	DYM	DYT	RT	RAM	DES
.39888710	.71229710	.14208719	.25228400	.14208719	.25228400	.14208719	.25228400	.14208719	.25228400	.14208719	.25228400	.14208719	.25228400
.41229710	.14208719	.25228400	.14208719	.25228400	.14208719	.25228400	.14208719	.25228400	.14208719	.25228400	.14208719	.25228400	.14208719
.41229727	.14208709	.25228400	.14208709	.25228400	.14208709	.25228400	.14208709	.25228400	.14208709	.25228400	.14208709	.25228400	.14208709
.13238624	.67070529	.29084615	.13906752	.29084615	.13906752	.29084615	.13906752	.29084615	.13906752	.29084615	.13906752	.29084615	.13906752
.32516600	.23172600	.62505499	.32516600	.23172600	.62505499	.32516600	.23172600	.62505499	.32516600	.23172600	.62505499	.32516600	.23172600
.32516600	.23172600	.62505499	.32516600	.23172600	.62505499	.32516600	.23172600	.62505499	.32516600	.23172600	.62505499	.32516600	.23172600
.15122592	.29467563	.02	.15122592	.29467563	.02	.15122592	.29467563	.02	.15122592	.29467563	.02	.15122592	.29467563
.14301579	.02	.02	.14301579	.02	.02	.14301579	.02	.02	.14301579	.02	.02	.14301579	.02
.34000000	.02	.02	.34000000	.02	.02	.34000000	.02	.02	.34000000	.02	.02	.34000000	.02

HELIOCENTRIC

X	Y	Z	DX	DY	PTH	PTX	PTE	DYS	DYM	DYT	RT	RAM	DES
.13637511	.73739278	.36182010	.13637511	.73739278	.36182010	.13637511	.73739278	.36182010	.13637511	.73739278	.36182010	.13637511	.73739278
.15503658	.36182010	.73739278	.15503658	.36182010	.73739278	.15503658	.36182010	.73739278	.15503658	.36182010	.73739278	.15503658	.36182010
.13238624	.67070529	.29084615	.13238624	.67070529	.29084615	.13238624	.67070529	.29084615	.13238624	.67070529	.29084615	.13238624	.67070529
.13238624	.67070529	.29084615	.13238624	.67070529	.29084615	.13238624	.67070529	.29084615	.13238624	.67070529	.29084615	.13238624	.67070529
.14851522	.33109201	.59256547	.14851522	.33109201	.59256547	.14851522	.33109201	.59256547	.14851522	.33109201	.59256547	.14851522	.33109201
.22295138	.59256547	.14851522	.22295138	.59256547	.14851522	.22295138	.59256547	.14851522	.22295138	.59256547	.14851522	.22295138	.59256547
.37184828	.41423374	.72056818	.37184828	.41423374	.72056818	.37184828	.41423374	.72056818	.37184828	.41423374	.72056818	.37184828	.41423374
.25470198	.72056818	.37184828	.25470198	.72056818	.37184828	.25470198	.72056818	.37184828	.25470198	.72056818	.37184828	.25470198	.72056818
.65147451	.11471345	.44173390	.65147451	.11471345	.44173390	.65147451	.11471345	.44173390	.65147451	.11471345	.44173390	.65147451	.11471345
.13156857	.44173390	.65147451	.13156857	.44173390	.65147451	.13156857	.44173390	.65147451	.13156857	.44173390	.65147451	.13156857	.44173390
.41229710	.12726248	.01	.41229710	.12726248	.01	.41229710	.12726248	.01	.41229710	.12726248	.01	.41229710	.12726248

325 DAYS 22 HRS. 3 MIN. 52.000 SEC.

GEOCENTRIC

X	Y	Z	DX	DY	PTH	PTX	PTE	DYS	DYM	DYT	RT	RAM	DES
.20989176	.81462337	.36182010	.20989176	.81462337	.36182010	.20989176	.81462337	.36182010	.20989176	.81462337	.36182010	.20989176	.81462337
.24447152	.36182010	.73739278	.24447152	.36182010	.73739278	.24447152	.36182010	.73739278	.24447152	.36182010	.73739278	.24447152	.36182010
.24447151	.73739278	.24447152	.24447151	.73739278	.24447152	.24447151	.73739278	.24447152	.24447151	.73739278	.24447152	.24447151	.73739278
.14842212	.22867135	.59256547	.14842212	.22867135	.59256547	.14842212	.22867135	.59256547	.14842212	.22867135	.59256547	.14842212	.22867135
.21823618	.59256547	.14842212	.21823618	.59256547	.14842212	.21823618	.59256547	.14842212	.21823618	.59256547	.14842212	.21823618	.59256547
.21823618	.59256547	.14842212	.21823618	.59256547	.14842212	.21823618	.59256547	.14842212	.21823618	.59256547	.14842212	.21823618	.59256547
.15050037	.29614919	.02	.15050037	.29614919	.02	.15050037	.29614919	.02	.15050037	.29614919	.02	.15050037	.29614919
.23074723	.02	.02	.23074723	.02	.02	.23074723	.02	.02	.23074723	.02	.02	.23074723	.02
.34000000	.02	.02	.34000000	.02	.02	.34000000	.02	.02	.34000000	.02	.02	.34000000	.02

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SPACE TRAJECTORIES

CASE 1

RA-5 PCSTMIDCOURSE ORBIT

HELIOCENTRIC

ECLIPTIC CCORDINATES

X	-15052104	C9	Y	-26050979	08	Z	-56998637	C6	DX	-34881295	C1	DY	-28949710	02	CZ	-19122934	00
R	-15275974	C9	LAT	-20628452	00	LON	-35018097	C3	V	-29159721	C2	PTH	-29498921	01	AZ	-89634381	C2
XE	-14842212	C9	YE	-24924551	C8	ZE	-54375000	02	DXE	-44560193	C1	DYE	-29277761	C2	DZE	-10563135	-02
XT	-14820388	C9	YT	-24609205	08	ZT	-93337499	04	DXT	-35950169	C1	DYT	-28728207	02	DZT	-87107181	-01
LTE	-20700666	-C4	LGE	-35046723	03	LTT	-35596964	-02	LOT	-35C572C7	C3	RST	-15C23316	09	VST	-28952402	02
EPS	-22271912	02	ESP	-35290886	00	SEP	-15736897	C3	EPH	-3856C262	C1	EMP	-25374768	02	MEP	-1507652C	C3
MPS	-24692645	02	MSP	-4438381C	C0	SMP	-15486351	03	SEM	-45802C17	C2	EMS	-13409308	C3	ESM	-10491172	C0
EPT	-38560262	01	ETP	-25374768	02	TEP	-15076920	C3	TPS	-24692645	C2	TSP	-44383810	C0	STP	-15486351	C3
SET	-45802C17	02	STE	-134C93C8	03	EST	-1C491172	CC	RPM	-2785813C	C7	RPT	-27858130	07	SPN	-22128712	02
GCE	-24718462	03	GCT	-25474307	03	SIP	-24656858	C2	CPT	-91211297	02	SIN	-91175549	02	CI	-18716263	-C1
REP	-24447152	C7	VEP	-1C399047	01	CPE	-93233486	02	CPS	-84424682	C2	D2	-16948292	-C1	D3	-24885636	-04

337 DAYS 13 HRS. 59 MIN. 14.955 SEC.

SEPT. 21, 1963

RECTIFICATION

JULIAN DATE 2438294.16346013

347 DAYS 4 HRS. 23 MIN. 14.955 SEC.

OCT. 1, 1963

RECTIFICATION

JULIAN DATE 2438303.76346012

349 DAYS 22 HRS. 3 MIN. 52.000 SEC.

OCT. 4, 1963

GECENTRIC

EQUATORIAL CCORDINATES

X	-54020428	06	Y	-13460675	C7	Z	-76691420	06	DX	-90640287	CC	DY	-18133236	00	DZ	-19162329	00
R	-16406936	07	DEC	-27867790	02	RA	-29186660	C3	V	-94401646	CC	PTH	-14680297	02	AZ	-27567257	03
R	-16406936	C7	LAT	-27867790	02	LON	-27990321	C3	VE	-1C667533	C3	PIE	-12849635	00	AZE	-27004848	03
XS	-14735758	09	YS	-23962975	08	ZS	-10391779	C8	DXS	-56812492	C1	DYS	-268C1485	02	DZS	-11622051	C2
XM	-33445353	06	YM	-13218172	06	ZM	-23167645	05	DXM	-4C815426	CC	DYM	-92633782	CC	DZM	-41163870	00
XT	-33445353	06	YT	-13218172	06	ZT	-23167645	05	DXT	-4C815426	CC	DYT	-92633782	00	DZT	-41163870	00
RS	-14965450	C9	VS	-29760179	02	RM	-36037190	C6	VM	-1C927662	C1	RT	-36C37190	06	VT	-10927662	C1
GED	-28028896	02	ALT	-16343202	07	LQS	-17727308	C3	RAS	-18923646	C3	RAM	-21564776	C2	LCM	-9601397C	C1
DUT	-34CC0C0C	02	DT	-15360C0C	C5	DR	-23923768	CC	SHA	-16194570	C7	DES	-39817347	C1	DEM	-36859816	01

HELIOCENTRIC

ECLIPTIC CCORDINATES

X	-14789778	C9	Y	-24579145	C8	Z	-16762600	C6	DX	-65876520	C1	DY	-29122740	02	CZ	-24783981	C0
R	-14992637	C9	LAT	-64061196	-C1	LON	-94357538	C1	V	-25859547	C2	PTH	-33106370	01	AZ	-89527339	02
XE	-14735758	09	YE	-26119211	C8	ZE	-45787500	C3	DXE	-56812492	C1	DYE	-29212868	02	DZE	-10752678	-C3
XT	-14769203	C9	YT	-26249699	08	ZT	-30874500	05	DXT	-60894C34	C1	DYT	-30226507	02	DZT	-90142488	-02
LTE	-17529513	-C3	LCE	-1C051314	02	LTT	-11792670	-C1	LOT	-1CC78C54	C2	RST	-15CC0561	09	VST	-3083379C	C2
EPS	-80152483	02	ESP	-61889315	00	SEP	-92228612	C2	EPH	-12317582	C2	EMP	-76226761	C2	MEP	-91455649	C2
MPS	-92401250	02	MSP	-64448734	C0	SMP	-86954284	02	SEM	-16769585	C3	EMS	-12274820	02	ESM	-28837468	-01
EPT	-12317582	02	ETP	-76226761	02	TEP	-91455649	02	TPS	-9240125C	C2	TSP	-64448734	00	STP	-86954284	02
SET	-16769585	C3	STE	-12274820	02	EST	-28837468	-C1	RPM	-16887224	C7	RPT	-16887224	07	SPN	-7992975C	02
GCE	-27816164	03	GCT	-27946716	C3	SIP	-9234228C	C2	CPT	-8C592693	C2	SIN	-80533724	02	CI	-30875428	-01
REP	-16406936	07	VEP	-944C1646	C0	CPE	-81759778	02	CPS	-88834739	C2	D2	-16421831	-02	D3	-169C7558	-C5

357 DAYS 5 HRS. 43 MIN. 36.200 SEC.

OCT. 11, 1963

JULIAN DATE 2438313.81926157

CASE 1

SPACE TRAJECTORIES

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RA-5 PCSTIMIDCOURSE CREIT

GEOCENTRIC

EQUATORIAL COORDINATES

X	-45776424	C5	Y	-14280931	C7	Z	-62767404	C6	DX	-5419C4C1	CC	DY	-77878036	-01	DZ	-24588253	CC
R	15606153	C7	DEC	-23715566	C2	RA	26816405	C3	V	97657891	CC	PTH	10928119	-06	AZ	28596216	C3
R	15606153	C7	LAT	-23715566	C2	LON	134C5230	C3	VE	10513054	C3	PTE	48371003	-06	AZE	27014636	C3
XS	-14261027	C9	YS	-46683096	C8	ZS	-17641680	C8	DXS	9322271C	C1	DYS	26066106	C2	DZS	-11276106	C2
XM	-22502052	C6	YM	28049827	C6	ZM	13420267	C6	DXM	8527744C	CC	DYM	54335948	CC	DZM	-14227442	CC
XT	-22502052	C6	YT	28049827	C6	ZT	13420267	C6	DXT	8527744C	CC	DYT	54335948	CC	DZT	-14227442	CC
RS	14934535	C9	VS	29839116	C2	RM	38382792	C6	VM	10211296	C1	RT	38382792	C6	VT	10211296	C1
GED	-23859187	C2	ALT	15542406	C7	LOS	61810344	C2	RAS	1559221C	C3	RAM	12873718	C3	LCM	35462543	C3
DUT	34000000	C2	DT	15360000	C5	DR	25030191	-08	SHA	-147600C4	C7	DES	-67840050	C1	DEM	20465465	C2

GEOCENTRIC

CCNIC

ORBITAL E.T AND B.R

EQUATORIAL COORDINATES

EPOCH	CF	PERICENTER	PASSAGE	JULIAN DATE	2438313.81926147	INC	15167288	C3	LAN	21358342	C3	APF	30204701	C3	RCA	15606153	C7
SPA	-90002915	C6	ECC	273396C8	C1	C1	442878C9	C0	SLR	58272764	C7	APC	00000000	CC	TFP	88201469	-02
VH	66549087	C0	C3	442878C9	C0	MA	37366633	-06	DAC	22423143	C2	RAD	16363258	C3	MTA	11145496	C3
TA	25613208	-05	EA	00000000	C0	WZ	-88025284	C0	PX	-29332288	-C1	PV	91508337	C0	PZ	-40219652	C0
WX	-26247269	C0	WY	39530119	C0	QZ	25177547	C0	RX	36598555	CC	RY	10748933	C0	RZ	-92439199	C0
CX	-96449348	C0	QY	-79745768	-01	SZC	38144381	CC	TX	28179597	CC	TY	95947435	C0	TZ	00000000	C0
SXD	-88693041	C0	SYQ	26048994	C0	BZ	-28223317	CC	MX	-96449350	CC	MY	-79745767	-01	MZ	25177948	C0
EX	-38008221	C0	BY	-88084161	C0	B	22901350	C7	PER	00000000	CC	OMD	10214490	-07	NCD	62565268	-08
B.T	-21807823	C7	B.R	65921851	C6												
C3J	83124527	C1															

HELIOCENTRIC

ECLIPTIC COORDINATES

X	14256450	C9	Y	42783543	C8	Z	-77651250	C4	DX	-10264175	C2	DY	28371885	C2	DZ	-25552714	C0
R	14884578	C9	LAT	-25890593	-02	LON	16704476	C2	V	30172545	C2	PTH	31841761	C1	AZ	8951418C	C2
XE	14261027	C9	YE	44343467	C8	ZE	-59999599	C2	DXE	-9322271C	C1	DYE	28345513	C2	DZE	-10420C84	-02
XT	14238525	C9	YT	44654203	C8	ZT	11470250	C5	DXT	-10175045	C2	DYT	27790403	C2	DZT	84599493	-01
LTE	-23018773	-04	LOE	17272642	C2	LTT	44041206	-C2	LOT	17412225	C2	RST	14922318	C9	VST	29594682	C2
EPS	10838511	C3	ESP	56816375	C0	SEP	71046718	C2	EPH	71603524	C1	EMP	30451373	C2	MEP	14238823	C3
MPS	10123056	C3	MSP	70779359	C0	SMP	78061654	C2	SEM	71371C33	C2	EMS	10848931	C3	ESM	13953216	C0
EPT	71603524	C1	ETP	30451373	C2	TEP	14238823	C3	TPS	10123056	C3	TSP	70779359	CC	STP	78061654	C2
SET	71371C33	C2	STE	10848931	C3	EST	13953216	C0	RPM	18793268	C7	RPT	18793268	C7	SPN	10815095	C3
GGE	28386173	C3	GCT	28356232	C3	SIP	10117757	C3	CPT	7659205C	C2	SIN	76539061	C2	CL	2774399C	-C1
REP	15606153	C7	VEP	97657891	C0	CPE	76680167	C2	CPS	90553370	C2	D2	57442898	-02	D3	54248483	-C5

365 DAYS 22 HRS. 3 MIN. 52.000 SEC.

JULIAN DATE 2438326.50000000

OCT. 24, 1963 00 CC 00.000

GEOCENTRIC

EQUATORIAL COORDINATES

X	-10927474	C7	Y	-14168706	C7	Z	-32518465	C6	DX	-97566693	CC	DY	84108518	-01	DZ	29419546	CC
R	18186161	C7	DEC	-10300387	C2	RA	23235914	C3	V	10225239	C1	PTH	27245445	C2	AZ	29459272	C3
R	18186160	C7	LAT	-10300387	C2	LON	20068298	C3	VE	13130366	C3	PTE	20426790	C0	AZE	27016760	C3
XS	-12905419	C9	YS	-67976667	C8	ZS	-29477281	C8	DXS	15329369	C2	DYS	23601408	C2	DZS	-10235587	C2
XM	-71671637	C5	YM	-36122305	C6	ZM	-15408527	C6	DXM	9518948C	CC	DYM	23479961	C0	DZM	75681849	-C2
XT	71671637	C5	YT	-36122305	C6	ZT	-15408527	C6	DXT	9518948C	CC	DYT	23479961	C0	DZT	75681849	-C2
RS	14881103	C9	VS	29946335	C2	RM	39920068	C6	VM	98045491	CC	RT	39920068	C6	VT	98045491	C0
GED	-10369064	C2	ALT	18122385	C7	LOS	17610093	C3	RAS	2077771C	C3	RAM	28122252	C3	LCM	24954635	C3
CLT	34000000	C2	DT	15360000	C5	DR	46811473	C3	SHA	-74435272	C6	DES	-11425018	C2	DEM	-22704872	C2

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SPACE TRAJECTORIES

CASE 1

RA-5 PCSTMIDCOURSE ORBIT

HELIOCENTRIC

ECLIPTIC COORDINATES

X	.12796144	09	Y	.72663475	C8	Z	.26540000	C6	DX	-.16305038	C2	DY	.25919559	02	DZ	.23748863	00
R	.14715360	09	LAT	.10333734	C0	LON	.29590266	02	V	.30622446	02	PTH	-.25813282	01	AZ	.89550535	02
XE	.12905419	C9	YE	.74092761	08	ZE	.50749959	02	DXE	-.15325369	C2	DYE	.25725351	02	DZE	.10397434	-02
XT	.12912586	09	YT	.73700053	08	ZT	.23947850	C4	DXT	-.14377474	C2	DYT	.25943779	02	CZT	-.85430025	-01
LTE	.19539955	-04	LOE	.25861049	02	LTT	.52285577	-C3	LOT	.29716052	C2	RST	.14867813	C9	VST	.29661401	02
EPS	.15554954	C3	ESP	.28981328	00	SEP	.24160634	02	EPM	.10855179	C2	EMP	.12091262	03	MEP	.48232200	02
MPS	.16455589	C3	MSP	.16207647	00	SMP	.15277899	02	SEM	.70482319	C2	EMS	.10937268	03	ESM	.14452265	CC
EPT	.10855179	02	ETP	.12091262	03	TEP	.48232200	C2	TPS	.16455589	C3	TSP	.16207647	00	STP	.15277899	C2
SET	.70482319	02	STE	.10937268	03	EST	.14452265	CC	APM	.15809929	C7	RPT	.15809929	C7	SPN	.15534859	03
GCE	.30458122	03	GCT	.32284920	C3	SIP	.16449690	03	CPT	.74233626	C2	SIN	.74170639	02	D1	.32979295	-01
REP	.18186161	C7	VEP	.10225239	01	CPE	.73078378	C2	CPS	.93564416	C2	D2	.31822977	-01	D3	.13272513	-03

37C DAYS 22 HRS. 15 MIN. 36.199 SEC.
 RECTIFICATION .90643606-02
 JULIAN DATE 2438327.50815047
 OCT. 25, 1963 00 11 44.200

38C DAYS 12 HRS. 39 MIN. 36.200 SEC.
 RECTIFICATION .25239923-01
 JULIAN DATE 2438337.10815045
 NOV. 3, 1963 14 35 44.200

389 DAYS 22 HRS. 3 MIN. 52.000 SEC.
 JULIAN DATE 2438346.50000000
 NOV. 13, 1963 00 00 00.000

GEOCENTRIC

EQUATORIAL COORDINATES

X	-.29122640	07	Y	-.13168030	07	Z	.11371550	06	DX	-.11127057	C1	DY	-.47243118	-01	DZ	.17644411	00
R	.31981530	07	CEC	.20376725	01	RA	.20433047	C3	V	.11275985	C1	PTH	.67130975	02	AZ	.28857488	C3
R	.31981531	07	LAT	.20376674	C1	LON	.15294142	03	VE	.23348327	C3	PTE	.25495815	00	AZE	.27003425	01
XS	-.95397739	08	YS	-.10387602	C9	ZS	-.45044083	08	DXS	.23270138	C2	DYS	-.17522492	02	DZS	-.75983748	01
XM	-.38943900	06	YM	-.10374900	06	ZM	-.59949599	04	DXM	.21168423	CC	DYM	-.87470293	00	DZM	-.37896198	C0
XT	-.38943900	06	YT	-.10374900	06	ZT	-.59949599	C4	DXT	.21168423	CC	DYT	-.87470293	00	DZT	-.37896198	C0
RS	.14805379	09	VS	.30104357	02	RM	.40306640	06	VM	.97648737	CC	R1	.40306640	C6	VT	.97648737	00
GED	.20515418	01	ALT	.31917748	07	LOS	.17604716	03	RAS	.22743623	C3	RAM	.19491748	03	LOM	.14352841	03
DUT	.34000000	02	DT	.86399999	05	DR	.10389644	01	SHA	-.16058012	C7	DES	-.17712524	02	DEM	-.85221892	00

HELIOCENTRIC

ECLIPTIC COORDINATES

X	.92485475	08	Y	.11205903	09	Z	.62783850	06	DX	-.24382844	C2	DY	.19125885	02	DZ	.18065071	00
R	.14529688	09	LAT	.24758069	00	LON	.50466177	02	V	.30989558	C2	PTH	-.14217252	01	AZ	.89659747	02
XE	.95397739	08	YE	.11322189	09	ZE	.37000000	03	DXE	-.23270138	C2	DYE	.19099032	02	DZE	-.23901462	-04
XT	.95008300	08	YT	.11312432	09	ZT	.35406000	05	DXT	-.23058454	C2	DYT	.18145765	02	DZT	.28949976	-03
LTE	-.14318740	-03	LOE	.49883404	02	LTT	.13732051	-01	LOT	.49974528	C2	RST	.14772843	09	VST	.29342138	02
EPS	.14922755	03	ESP	.63323127	00	SEP	.30139212	02	EPM	.14094492	C1	EMP	.16874535	03	MEP	.98451746	01
MPS	.14993452	03	MSP	.54437597	00	SMP	.29521050	02	SEM	.36130193	C2	EMS	.14377763	03	ESM	.91993210	-01
EPT	.14094492	01	ETP	.16874535	03	TEP	.98451746	C1	TPS	.14993452	C3	TSP	.54437597	CC	STP	.29521050	02
SET	.36130193	02	STE	.14377763	03	EST	.91993210	-01	APM	.28018701	C7	RPT	.28018701	07	SPN	.14911328	03
GCE	.78508750	02	GCT	.76100218	02	SIP	.14989897	03	CPT	.76106849	C2	SIN	.76071307	02	D1	.18609003	-01
REP	.31981530	07	VEP	.11275985	01	CPE	.77232468	02	CPS	.98033310	C2	D2	.16198032	-01	D3	.20389000	-04

40C DAYS 22 HRS. 3 MIN. 52.000 SEC.
 JULIAN DATE 2438366.50000000
 DEC. 3, 1963 00 00 00.000

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CASE 1

SPACE TRAJECTORIES

RA-5 POSTMIDCOURSE ORBIT

GEOCENTRIC

EQUATORIAL COORDINATES

X	-48669050	07	Y	-16927710	07	Z	-23026950	06	DX	-11175573	01	DY	-42921603	00	DZ	-59698670	-01
R	-51580288	07	CEC	-25587015	01	RA	-19917832	03	V	-11986345	01	PTH	-84285168	02	AZ	-16130019	03
R	-51580291	07	LAT	-25587015	01	LON	-12807617	03	VE	-37571805	03	PTE	-18188111	00	AZE	-26998275	03
XS	-50213651	08	YS	-12721123	09	ZS	-55163302	08	DXS	-28482396	02	DYS	-92094716	01	DZS	-39922215	01
XM	-51690999	05	YM	-33013500	06	ZM	-14110400	06	DXM	-10755508	01	DYM	-13278019	00	DZM	-49385935	-01
XT	-51690999	05	YT	-33013500	06	ZT	-14110400	06	DXT	-10755508	01	DYT	-13278019	00	DZT	-49385935	-01
RS	-14746897	09	VS	-30199322	02	RM	-36272774	06	VM	-10848108	01	RT	-36272774	06	VT	-10848108	01
GED	-25761151	01	ALT	-51516506	07	LOS	-17735738	03	RAS	-24845953	03	RAM	-98898856	02	LOM	-27756715	02
DLT	-34000000	02	DT	-11728000	06	DR	-11926771	01	SHA	-41733085	07	DES	-21966669	02	DEM	-22892789	02

HELIOCENTRIC

ECLIPTIC COORDINATES

X	-45346745	08	Y	-13719529	09	Z	-88477749	06	DX	-29599553	02	DY	-96200026	01	DZ	-114777125	00
R	-14449795	09	LAT	-35083096	00	LON	-71709883	02	V	-31124184	02	PTH	-28462081	00	AZ	-89786970	02
XE	-50213651	08	YE	-13865673	09	ZE	-63500000	02	DXE	-28482396	02	DYE	-10037539	02	DZE	-12173951	-02
XT	-50161559	08	YT	-13901575	09	ZT	-18210000	04	DXT	-29557517	02	DYT	-99353673	01	DZT	-96917271	-01
LIE	-24671507	-04	LOE	-70092465	02	LIT	-70597666	-03	LOT	-70158701	02	RST	-14778903	09	VST	-31183190	02
EPS	-12433788	03	ESP	-16550043	01	SEP	-54007100	02	EPM	-39385607	01	EMP	-77616230	02	MEP	-98445207	02
MPS	-12825309	03	MSP	-15904854	01	SMP	-50156400	02	SEM	-15189800	03	EMS	-28035752	02	ESM	-66351990	-01
EPT	-39385607	01	ETP	-77616230	02	TEP	-98445207	02	TPS	-12825309	03	TSP	-15904854	01	STP	-50156400	02
SST	-15189800	03	STE	-28035752	02	EST	-66351990	-01	RPM	-52236371	07	RPT	-52236371	07	SPN	-12426703	03
GCE	-85533795	02	GCT	-85002166	02	SIP	-12823403	03	CPT	-78998230	02	SIN	-78979167	02	D1	-59815515	-02
REP	-51580288	07	VEP	-11986345	01	CPE	-79874846	02	CPS	-10153520	03	D2	-63967554	-02	D3	-27712752	-05

HELIOCENTRIC

ECLIPTIC COORDINATES

EPOCH	CF	PERICENTER	PASSAGE	JULIAN DATE	2438371.63034301	ORBITAL	B.T AND B.R	DEC.	8, 1963	C3	C7	41.637					
SMA	-15286221	09	ECC	-54942150	-01	INC	-41033545	00	LAN	-12976893	02	APF	-64205699	02	RCA	-14446364	09
VH	-27888523	02	C3	-86820302	03	C1	-44973255	10	SLR	-15240078	09	APD	-16126079	09	TFP	-44326163	06
TA	-54720606	01	EA	-51796500	01	MA	-48954573	01	DAI	-36954653	00	RAI	-77182021	02	MTA	-18000000	03
WX	-16086257	-02	WY	-69805654	-02	WZ	-95997436	00	PX	-22184921	00	PY	-97505667	00	PZ	-64497399	-02
CX	-97507668	00	QY	-22183314	00	QZ	-31171340	-02	RX	-14309036	-02	RY	-62850109	-02	RZ	-59997628	00
SXI	-22184521	00	SYI	-97505667	00	SZI	-64497399	-02	TX	-97507575	00	TY	-22185447	00	TZ	-00000000	00
BX	-97507551	00	BY	-22183378	00	BZ	-31171431	-02	MX	-54948022	00	MY	-31380485	00	MZ	-37175889	-02
B.T	-152663013	09	E.R	-47578080	06	B	-152663087	09	PER	-37727291	03	DEF					C3J

620613300503	221546012466	217434751367	601641713452	201664240727	200551775014
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APPENDIX F

Tables Related to Trajectory Printout

Table F-1. Ranger 5 trajectory key

COLUMN ROW	1	2	3	4	5	6
GROUP A	1 GME	J	H	D	RE	REM
	2 G	A	B	C	OME	AU
	3 GMM	GMS	GMV	MA	GMB	GMJ
GROUP B	INJECTION CONDITIONS		TARGET	JULIAN DATE	MONTH, DAY, YEAR	hr min sec
	4 GEOCENTRIC	XO	YO	ZO	DXO	DYO
	5 CARTESIAN			TO	GHA	GHO
GROUP C	TIME PAST INJECTION			JULIAN DATE	MONTH, DAY, YEAR	hr min sec
	GEOCENTRIC				EQUATORIAL COORDINATES	
	6 X	Y	Z	DX	DY	DZ
	7 R	DEC	RA	V	PTH	AZ
	8 R	LAT	LON	VE	PTE	AZE
	9 XS	YS	ZS	DXS	DYS	DZS
	10 XM	YM	ZM	DXM	DYM	DZM
	11 XT	YT	ZT	DXT	DYT	DZT
	12 RS	VS	RM	VM	RT	VT
	13 GED	ALT	LOS	RAS	RAM	LOM
	14 DUT	DT	DR	SHA	DES	DEM
	GEOCENTRIC			CONIC	ORBITAL B • T AND B • R EQUATORIAL COORDINATES	
	EPOCH OF PERICENTER PASSAGE			JULIAN DATE	MONTH, DAY, YEAR	hr min sec
	GROUP D	15 SMA	ECC	INC	LAN	APF
16 VH		C3	C1	SLR	APO	TFP
17 TA		EA	MA	DAO	RAO	MTA
18 WX		WY	WZ	PX	PY	PZ
19 QX		QY	QZ	RX	RY	RZ
20 SXO		SYO	SZO	TX	TY	TZ
21 BX		BY	BZ	MX	MY	MZ
22 B • T		B • R	B	PER	OMD	NOD
23 C3J						
HELIOCENTRIC				EQUATORIAL COORDINATES		
GROUP E	24 X	Y	Z	DX	DY	DZ
	25 R	LAT	LON	V	PTH	AZ
	26 XE	YE	ZE	DXE	DYE	DZE
	27 XT	YT	ZT	DXT	DYT	DZT
	28 LTE	LOE	LTT	LOT	RST	VST
	29 EPS	ESP	SEP	EPM	EMP	MEP
	30 MPS	MSP	SMP	SEM	EMS	ESM
	31 EPT	ETP	TEP	TPS	TSP	STP
	32 SET	STE	EST	RPM	RPT	SPN
	33 GCE	GCT	SIP	CPT	SIN	D1
	34 REP	VEP	CPE	CPS	D2	D3
	SELENOCENTRIC				EQUATORIAL COORDINATES	
GROUP F	35 X	Y	Z	DX	DY	DZ
	36 R	DEC	RA	V	PTH	AZ
	37 R	LAT	LON	VR	PTR	AZR
	38 LTS	LNS	LTE	LNE		
	39 ALT	SHA	ALP	DR	DP	ASD
	40 HGE	SVL	HNG	SIA		
	SELENOCENTRIC			CONIC	ORBITAL B • T AND B • R EQUATORIAL COORDINATES	
EPOCH OF PERICENTER PASSAGE			JULIAN DATE	MONTH, DAY, YEAR	hr min sec	
GROUP G	41 SMA	ECC	INC	LAN	APF	RCA
	42 VH	C3	C1	SLR	APO	TFP
	43 TA	EA	MA	DAI	RAI	MTA
	44 WX	WY	WZ	PX	PY	PZ
	45 QX	QY	QZ	RX	RY	RZ
	46 SXO	SYO	SZO	DAO	RAO	TF
	47 SXI	SYI	SZI	TX	TY	TZ
	48 BX	BY	BZ	MX	MY	MZ
	49 B • T	B • R	B	PER	DEF	C3J
GROUP H	50 XOCTAL	YOCTAL	ZOCTAL	XOCTAL	YOCTAL	ZOCTAL
	51	YY MM DDD HH		TT SS SSS		SOCTAL

Table F-2. Ranger 5 trajectory key definitions

Group		Trajectory constant	Group	Trajectory constant						
Group A			Group C							
Row 1	GME	Universal gravitational constant times the mass of Earth, km ³ /sec ²	Row 6	Inertial position and velocity of the probe, Sun, Moon and target body in a geocentric equatorial system. The principal direction X is the vernal equinox direction of date and the principal plane XY is the equatorial plane of date. Z is along the direction of the Earth's spin axis of date. Miscellaneous parameters are also included.						
	J	Coefficient of the second harmonic in the Earth's potential function								
	H	Coefficient of the third harmonic in the Earth's potential function								
	D	Coefficient of the fourth harmonic in the Earth's potential function								
	RE	Earth radius used in the potential function, km								
	REM	Conversion factor for converting lunar ephemerides into km								
Row 2	G	Universal constant of gravitation, km ³ /kg sec ²	Row 7	Cartesian components of the probe radius vector, km						
	A } B } C }	Moments of inertia about principal axis for the Moon, kg km ²								
	OME	Sidereal rotation rate of the Earth, deg/sec								
	AU	Astronomical unit, km								
Row 3	GMM	Universal gravitational constant times the mass of Moon, km ³ /sec ²	Row 8 ^a	Cartesian components of the probe space-fixed velocity vector, km/sec						
	GMS	Universal gravitational constant times the mass of Sun, km ³ /sec ²								
	GMV	Universal gravitational constant times the mass of Venus, km ³ /sec ²								
	GMA	Universal gravitational constant times the mass of Mars, km ³ /sec ²								
	GMB	Universal gravitational constant times the mass of Earth-Moon, km ³ /sec ²								
	GMJ	Universal gravitational constant times the mass of Jupiter, km ³ /sec ²								
Group B			Row 9	Probe radius distance, km						
Row 4	XO } YO } ZO }	Cartesian components of the probe radius vector, km	LAT	Probe geocentric latitude, deg						
				DXO } DYO } DZO }	Probe East longitude, deg					
	Cartesian components of the probe space-fixed velocity vector, km/sec	VE	Probe Earth-fixed velocity, km/sec							
Row 5	TO	Time of injection in seconds past midnight of day before launch, sec	PTE	Pitch angle of the probe Earth-fixed velocity vector with respect to the local horizontal, deg						
	GHA	HA of Greenwich at injection epoch, deg	AZE	Azimuth angle of the probe Earth-fixed velocity vector measured East of true North, deg						
	GHO	HA of Greenwich at midnight of day before launch, deg								
			Row 10	Cartesian components of the Sun radius vector, km						
			Row 11	Cartesian components of the Sun space-fixed velocity vector, km/sec						
					Row 12	Cartesian components of the Moon radius vector, km				
							Row 13	Cartesian components of the Moon space-fixed velocity vector, km/sec		
									Row 14	Cartesian components of the target radius vector, km
			Row 16	Sun radius distance, km						
					Row 17	Sun space-fixed velocity, km/sec				
							Row 18	Moon radius distance, km		
									Row 19	Moon space-fixed velocity, km/sec
			Row 21	Target space-fixed velocity, km/sec						
					Row 22					
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Table F-2. (Cont'd)

Group	Trajectory constant	Group	Trajectory constant
Row 13 GED ALT LOS RAS RAM LOM	Geodetic latitude of the probe, deg Altitude of the probe above the Earth's surface, km East longitude of the Sun in coordinate system defined in Row 8, deg Right ascension of the Sun, deg Right ascension of the Moon, deg East longitude of the Moon in coordinate system defined in Row 8, deg	Row 21 BX } BY } BZ } MX } MY } MZ }	Components of the impact parameter B^b , km Components of a unit vector which lies in the orbit plane and is normal to the radius vector R $M = W \times \frac{R}{ R }$
Row 14 DUT DT DR SHA DES DEM	Ephemeris time minus universal time, sec Adams-Moulton step size, sec Radial velocity of probe, km/sec Sun shadow parameter, km Declination of the Sun, deg Declination of the Moon, deg	Row 22 B • T B • R B PER OMD NOD	Projection of the impact parameter B^b upon the vector T , km Projection of the impact parameter B^b upon the vector R , km The magnitude of the impact parameter, ^b km Period, min Rate of change of argument of perigee, deg/day Rate of change of RA of the ascending node, deg/day
Group D	Characteristics of the Earth conic in the geocentric equatorial system described under Group B	Row 23 C3J	Earth-Moon Jacobi constant, km ² /sec ²
Row 15 SMA ECC INC LAN APF RCA	Semimajor axis, km Eccentricity Inclination of the orbit plane to the equatorial plane, deg Longitude of the ascending node, deg Argument of pericenter, deg Magnitude of the closest approach vector, km	Group E	Inertial position and velocity of the probe, Sun, Moon and target body in a heliocentric equatorial system. The principal direction X is the vernal equinox direction of date and the principal plane XY is the equatorial plane of date. Z is along the direction of the Earth's spin axis of date. Miscellaneous parameters are also included.
Row 16 VH C3 C1 SLR APO TFP	Hyperbolic excess speed, km/sec Twice the energy (<i>vis viva</i> energy integral, km ² /sec ²) Angular momentum, km ² /sec Semi-latus rectum, km Apogee distance, km Time from pericenter passage, sec	Row 24 X } Y } Z } DX } DY } DZ }	Cartesian components of the probe radius vector, km Cartesian components of the probe space-fixed velocity vector, km/sec
Row 17 TA EA MA DAO RAO MTA	True anomaly, deg Eccentric anomaly, deg Mean anomaly, deg Declination of the outgoing asymptote, ^b deg Right ascension of the outgoing asymptote, ^b deg Maximum true anomaly, deg	Row 25 R LAT LON V PTH AZ	Sun probe radius distance, km Probe celestial declination, deg Probe celestial right ascension, deg Probe space-fixed velocity, km/sec Pitch angle of the probe space-fixed velocity vector with respect to the local horizontal, deg Azimuth angle of the probe space-fixed velocity vector measured East of true North, deg
Row 18 WX } WY } WZ } PX } PY } PZ }	Components of a unit vector normal to the conic $W = \frac{R \times V}{ R \times V }$ Components of a unit vector in the direction of perigee	Row 26 XE } YE } ZE } DXE } DYE } DZE }	Cartesian components of the Earth radius vector, km Cartesian components of the Earth space-fixed velocity vector, km/sec
Row 19 QX } QY } QZ } RX } RY } RZ }	Components of a unit vector perpendicular to the perigee direction, vector P , and being in the orbit plane $Q = W \times P$ Components of the unit vector R^b	Row 27 XT } YT } ZT } DXT } DYT } DZT }	Cartesian components of the target radius vector, km Cartesian components of the target space-fixed velocity vector, km/sec
Row 20 SXO } SYO } SZO } TX } TY } TZ }	Components of the unit vector S_0^b along the direction of the outgoing asymptote Components of the unit vector T^b		

^bSee Appendix C.

Table F-2. (Cont'd)

Group	Trajectory constant	Group	Trajectory constant
Row 28 LTE LOE LTT LOT RST VST	Celestial latitude of the Earth, deg Celestial longitude of the Earth, deg Celestial latitude of the target, deg Celestial longitude of the target, deg Sun-target range, km Sun-target velocity, km/sec	Row 37, 38, 39	Selenocentric-fixed spherical coordinates of the probe, Sun and Earth in a selenocentric equatorial system. The principal direction X is in the direction of the mean Moon-Earth line. The principal plane XY is the mean selenocentric equatorial plane. Z is along the direction of the Moon's mean spin axis. Miscellaneous parameters are also included.
Row 29 EPS ESP SEP EPM EMP MEP	Earth-probe-Sun angle, deg Earth-Sun-probe angle, deg Sun-Earth-probe angle, deg Earth-probe-Moon angle, deg Earth-Moon-probe angle, deg Moon-Earth-probe angle, deg	Row 35 X Y Z DX DY DZ	Cartesian components of the probe radius vector, km Cartesian components of the probe velocity vector, km/sec
Row 30 MPS MSP SMP SEM EMS ESM	Moon-probe-Sun angle, deg Moon-Sun-probe angle, deg Sun-Moon-probe angle, deg Sun-Earth-Moon angle, deg Earth-Moon-Sun angle, deg Earth-Sun Moon angle, deg	Row 36 R DEC RA V PTH AZ	Probe radius distance, km Probe declination angle, deg Probe right ascension angle, deg Probe space-fixed velocity, km/sec Pitch angle of the probe space-fixed velocity vector with respect to the local horizontal, deg Azimuth angle of the probe space-fixed velocity vector measured East of true North, deg
Row 31 EPT ETP TEP TPS TSP STP	Earth-probe-target angle, deg Earth-target-probe angle, deg Target-Earth-probe angle, deg Target-probe-Sun angle, deg Target-Sun-probe angle, deg Sun-target-probe angle, deg	Row 37 R LAT LON VR RTR AZR	Probe radius distance, km Probe selenocentric latitude, deg Probe selenocentric East longitude, deg Probe selenocentric-fixed velocity, km/sec Pitch angle of the probe selenocentric-fixed velocity vector with respect to the local horizontal, deg Azimuth angle of the probe selenocentric-fixed velocity vector measured East of the Moon's mean spin axis, deg
Row 32 SET STE EST RPM RPT SPN	Sun-Earth-target angle, deg Earth-Sun-target angle, deg Earth-Sun-target angle, deg Moon probe radius distance, km Target probe radius distance, km Sun-probe-near limb of Earth angle, deg	Row 38 LTS LNS LTE LNE	Selenocentric latitude of the Sun, deg Selenocentric longitude of the Sun, deg Selenocentric latitude of the Earth, deg Selenocentric longitude of the Earth, deg
Row 33 GCE GCT SIP CPT SIN D1	Clock angle of Earth, deg Clock angle of target, deg Sun-probe-near limb of target angle, deg Canopus-probe-near limb of target angle, deg Canopus-probe-near limb of target angle, deg Radius of a circle (target) used in construction of visible planet, cm	Row 39 ALT SHA ALP DR DP ASD	Altitude of the probe above the Moon's surface, km Sun shadow parameter, km Illuminated crescent orientation viewing angle, deg First time derivative of the probe radius distance, km/sec First time derivative of the probe radius direction, deg/sec Angular semidiameter of Moon as seen from the probe, deg
Row 34 REP VEP CPE CPS D2 D3	Earth probe distance, km Velocity of the probe with respect to Earth, km/sec Canopus-probe-Earth angle, deg Canopus-probe-Sun angle, deg Semiminor axis of ellipse used in construction of visible planet, cm Distance from intersection of ellipse with circle to the diameter (of the circle) that is perpendicular to D1, in construction of visible planet, cm	Row 40 HGE SVL HNG SIA	Right ascension of Earth in probe coordinate system, ^c deg Declination of the Moon in probe coordinate system, ^c deg Right ascension of the Moon in probe coordinate system, ^c deg Earth-probe-Moon angle minus ASD, deg
Group F Row 35, 36	Inertial position of probe in a selenocentric equatorial system. The principal direction X is the vernal equinox direction of date and the principal plane XY is the geocentric equatorial plane of date. Z is along the direction of the Earth's spin axis of date.	Group G	Characteristics of the selenocentric conic in the geocentric equatorial system described under Group B except centered at the Moon.

^cSame coordinate system as defined under B except centered at the probe.

Table F-2. (Cont'd)

Group	Trajectory constant	Group	Trajectory constant
Row 41 SMA ECC INC LAN APF RCA	Semimajor axis, km Eccentricity Inclination of the orbit plane to the equatorial plane, deg Longitude of the ascending node, deg Argument of pericenter, deg Magnitude of the closest approach vector, km	Row 47 SXI } SYI } SZI } TX } TY } TZ }	Components of the unit vector $\mathbf{S}_1^b$ along the direction of the outgoing asymptote Components of the unit vector $\mathbf{T}^b$
Row 42 VH C3 C1 SLR APO TFP	Hyperbolic excess speed, km/sec Twice the energy (<i>vis viva</i> energy integral, km^2/sec^2) Angular momentum, km^2/sec Semi-latus rectum, km Apogee distance, km Time from pericenter passage, sec	Row 48 BX } BY } BZ } MX } MY } MZ }	Components of the impact parameter $\mathbf{B}^b$, km Components of a unit vector which lies in the orbit plane and is normal to the radius vector $\mathbf{R}$. $\mathbf{M} = \mathbf{W} \times \frac{\mathbf{R}}{ \mathbf{R} }$
Row 43 TA EA MA DAI RAI MTA	True anomaly, deg Eccentric anomaly, deg Mean anomaly, deg Declination of the outgoing asymptote, ^b deg Right ascension of the outgoing asymptote, ^b deg Maximum true anomaly, deg	Row 49 B • T B • R B PER DFF C3J	Projection of the impact parameter $\mathbf{B}^b$ upon the vector $\mathbf{T}$, km Projection of the impact parameter $\mathbf{B}^b$ upon the vector $\mathbf{R}$, km The magnitude of the impact parameter $\mathbf{B}^b$, km Period, min Angle between the incoming and outgoing asymptotes, deg Earth-Moon Jacobi constant, km^2/sec^2
Row 44 WX } WY } WZ } PX } PY } PZ }	Components of a unit vector normal to the conic $\mathbf{W} = \frac{\mathbf{R} \times \mathbf{V}}{ \mathbf{R} \times \mathbf{V} }$ Components of a unit vector in the direction of perigee	Group H	Cartesian coordinates and epoch of injection conditions in the geocentric equatorial system described under Group B.
Row 45 QX } QY } QZ } RX } RY } RZ }	Components of a unit vector perpendicular to the perigee direction, vector $\mathbf{P}$, and being in the orbit plane $\mathbf{Q} = \mathbf{W} \times \mathbf{P}$ Components of the unit vector $\mathbf{R}^b$	Row 50 XOCTAL } YOCTAL } ZOCTAL } XOCTAL } YOCTAL } ZOCTAL }	Cartesian components of the probe radius vector at injection in octal representation, km Cartesian components of the probe space-fixed velocity vector at injection in octal representation, km/sec
Row 46 SXO } SYO } SZO } DAO RAO TF	Components of the unit vector $\mathbf{S}_0^b$ along the direction of the outgoing asymptote Declination of the outgoing asymptote, ^b deg Right ascension of the outgoing asymptote, ^b deg Time from injection to epoch of pericenter passage, hr	Row 51 YY MM DD HH TT SSSS SOCTAL	Epoch of injection Years past 1900 Month Day of month Hours Min msec Sec in octal representation The time past midnight GMT on day (DD), month (MM) and year (YY + 1900) at which the injection epoch occurs is the time determined by the sum of HH, TT, SSSS, and SOCTAL.

^bSee Appendix C.

Table F-3. Ranger 5 trajectory constants and conversion factors

Constants	Conversion factors
GM_{Sun}	$1.32715445 \times 10^{11} \text{ km}^3/\text{sec}^2$
GM_{Venus}	$3.247695 \times 10^8 \text{ km}^3/\text{sec}^2$
$GM_{\oplus}^a$	$3.986032 \times 10^8 \text{ km}^3/\text{sec}^2$
$GM_{\oplus-\zeta}$	$4.03503 \times 10^8 \text{ km}^3/\text{sec}^2$
GM_{ζ}^b	$4.900759 \times 10^8 \text{ km}^3/\text{sec}^2$
GM_{Mars}	$4.297780 \times 10^4 \text{ km}^3/\text{sec}^2$
GM_{Jupiter}	$1.267106 \times 10^8 \text{ km}^3/\text{sec}^2$
$M_{\text{Sun}}/M_{\text{Venus}}$	408645
$M_{\text{Sun}}/M_{\text{Earth}}$	332951.3
$M_{\text{Earth}}/M_{\text{Moon}}$	81.335
$M_{\text{Sun}}/M_{\text{Earth-Moon}}$	328908
$M_{\text{Sun}}/M_{\text{Mars}}$	3,088,000
$M_{\text{Sun}}/M_{\text{Jupiter}}$	1047.39
Equatorial radius of Earth	6378.3149 km
1 AU	$1.495990 \times 10^8 \text{ km}$
Ellipticity of Earth	1/298.3
Conversion from feet to meters	0.3048
Atmospheric model	1959 ARDC
Sidereal rotation rate of Earth	$4.1780742 \times 10^{-3} \text{ deg/sec}$
Universal constant of gravitation	$6.671 \times 10^{-20} \text{ km}^2/\text{kg sec}^2$
Speed of light	$2.997925 \times 10^8 \text{ km/sec}$
Mean Moon radius	1738.09 km
Moon moments of inertia about principal axis	$A = 0.88746 \times 10^{29} \text{ kg km}^2$ $B = 0.88764 \times 10^{29} \text{ kg km}^2$ $C = 0.88801 \times 10^{29} \text{ kg km}^2$
Lunar and solar ephemerides	The Moon and Sun positions are obtained from the joint JPL-STL ephemerides. For purposes of converting into kilometers, the conversion factors are: $1 \text{ AU} = 1.495990 \times 10^8 \text{ km}$ $1 \text{ e.r.} = 6378.3149$
Geometrical Earth model, used in locating tracking and launching facilities upon the Earth	Clarke spheroid of 1866 $a = 6378.2064 \text{ km}$ $b = 6356.5838 \text{ km}$ $e^2 = 0.006768657997291$
Earth potential function:	
$\Phi(R, \phi) = \frac{GM_{\oplus}}{R} \left[1 + \frac{JR_{\oplus}^2}{3R^2} (1 - 3 \sin^2 \phi) + \frac{H}{5} \frac{R_{\oplus}^2}{R^2} (3 - 5 \sin^2 \phi) (\sin \phi) + \frac{D}{35} \frac{R_{\oplus}^4}{R^4} (3 - 30 \sin^2 \phi + 35 \sin^4 \phi) \right]$	
where	
	$R = \text{geocentric distance}$
	$\phi = \text{geocentric latitude}$
	$J = 1.62345 \times 10^{-3}$
	$H = -0.575 \times 10^{-5}$
	$D = 0.7875 \times 10^{-5}$
^a 3.9860005 $\times 10^8 \text{ km}^3/\text{sec}^2$ was used for the premidcourse orbit.	
^b 4.9007604 $\times 10^8 \text{ km}^3/\text{sec}^2$ was used for the premidcourse orbit.	

APPENDIX G

Ranger 5 Orbit Determination Program Printout

ITERATION NUMBER 2

[illegible]

CASE 1

SPACE TRAJECTORIES

1

EPHEMERIDES WITH VENUS VELOCITIES

GME .39860005 06 J .16234500-02 H -.57499999-05 D .78749999-05 RE .63781650 04 REM .63783149 04
 G .66709998-19 A .88745998 29 B .88763998 29 C .88800998 29 OME .41780741-02 AU .14959900 09
 GMM .49007604 04 GMS .13271544 12 GMV .32476952 06 GMA .42977799 05 GMB .37918700 08 GMJ .12671062 09
 ARA .27890000 01 GB .00000000 00 MAS .34070000 03 G81 .00000000 00 G82 .00000000 00 SC .00000000 00

INJECTION CONDITIONS

MOON

JULIAN DATE 2437956.23429397

OCT. 18, 1962 17 37 23.000

GEOCENTRIC X0 .58372045 04 Y0-.18712691 04 Z0-.28917841 04 DX0 .36254799 01 DY0 .97646341 01 DZ0-.28587345 01

CARTESIAN GMC .00000000 00 SGC .00000000 00 TO .63443000 05 GHA .29107121 03 GHO .26001651 02

0 DAYS 0 HRS. 0 MIN. 0.000 SEC.

JULIAN DATE 2437956.23429397

OCT. 18, 1962 17 37 23.000

GEOCENTRIC

EQUATORIAL COORDINATES

X .53072042 04 Y -.18712691 04 Z -.28917840 04 DX .36254799 01 DY .97646336 01 DZ -.28587344 01
 R .67518652 04 DEC -.25359349 02 RA .34213937 03 V .10801136 02 PTH .87138041 01 AZ .10292465 03
 R .67518651 04 LAT -.25359349 02 LON .51068167 02 VE .10373188 02 PTE .90762695 01 AZE .10348129 03
 XS -.13520355 09 YS -.57485767 08 ZS -.24927463 08 DXS .12999477 02 DYS -.24699600 02 DZS -.10709378 02
 XM -.35387369 05 YM .35420195 06 ZM .13533407 06 DXM -.10263042 01 DYM -.47486982-01 DZM .61074528-01
 XT -.35387369 05 YT .35420195 06 ZT .13533407 06 DXT -.10263042 01 DYT -.47486982-01 DZT .61074528-01
 RS .14901675 09 VS .29895608 02 RM .38082357 06 VM .10292159 01 RT .38082357 06 VT .10292159 01
 GED -.25510276 02 ALT .37761981 03 LOS .27196299 03 RAS .20303420 03 RAM .95705333 02 LOM .16463412 03
 DUT .49007604 04 DT .37500000 01 DR .16363608 01 SHA .53923416 04 DES -.96296881 01 DEM .20816250 02

GEOCENTRIC

CONIC ORBITAL B.T AND B.R

EQUATORIAL COORDINATES

EPOCH OF PERICENTER PASSAGE SMA .28338684 06 ECC .97672775 00 INC .28267547 02 LAN .10032215 03 APF .22709996 03 RCA .65950499 04
 VH .12868401 00 C3 -.14065581 01 C1 .72086038 05 SLR .13036618 05 APO .56017862 06 TFP .18867780 03
 TA .17636902 02 EA .19287501 01 MA .45242081-01 DAO -.20299310 02 RAO .32378684 03 MTA .18000000 03
 WX .46592479 00 WY .84859005-01 WZ .88074573 00 PX .75671530 00 PY -.55409889 00 PZ -.34692437 00
 QX .45858040 00 QY .82811441 00 QZ -.32238242 00 RX -.74409102-01 RY .45422293 00 RZ -.88777515 00
 SX0 .75671530 00 SY0 -.55409869 00 SZ0 -.36692437 00 TX -.64949612 00 TY -.69760744 00 TZ -.30248748 00
 BX -.45858043 00 BY -.82811446 00 BZ .32238244 00 MX .20775271 00 MY .95707244 00 MZ -.20211662 00
 B.T .47289826 05 B.R -.38184787 05 B .60781623 05 PER .25022428 05 OMD .11568763-01 NOD -.70793174-02

HELIOCENTRIC

ECLIPTIC COORDINATES

X .13520936 09 Y .62654867 08 Z -.16775000 04 DX -.93739967 01 DY .34742733 02 DZ -.65083363 01
 R .14902081 09 LAT -.64496807-03 LON .24862606 02 V .36568945 02 PTH .96058464 01 AZ .10039908 03
 XE .13520355 09 YE .62657735 08 ZE .23125000 03 DXE .12999477 02 DYE .26921386 02 DZE -.88334083-03
 XT .13516816 09 YT .63036539 08 ZT -.16518000 05 DXT -.14025781 02 DYT .26902116 02 DZT .74041843-01
 LTE .88913821-04 LOE .24864544 02 LTT -.63456084-02 LOT .25002294 02 RST .14914435 09 VST .30338949 02
 EPS .52998805 02 ESP .27453512-18 SEP .12699912 03 EPM .59788080 02 EMP .87779073 00 MEP .11933403 03
 MPS .10868797 03 MSP .13970734 00 SMP .71172218 02 SEM .10950789 03 EMS .70354204 02 ESM .13776809 00
 EPT .59788080 02 ETP .87779073 00 TEP .11933403 03 TPS .10868797 03 TSP .13970734 00 STP .71172218 02
 SET .10950789 03 STE .70354204 02 EST .13776809 00 RPM .38417640 06 RPT .38417640 06 SPN -.17845056 02
 SAC .00000000 00 GCT .28628363 03 GCE .26321723 03 REP .67518652 04 SIN .73508037 02

2

SPACE TRAJECTORIES

CASE 1

HELIOCENTRIC

EPOCH OF PERICENTER		PASSAGE	CONIC		ORBITAL B.T. AND B.R.		ECLIPTIC COORDINATES	
SMA	ECC		JULIAN DATE	2437933.91683991	APF	SEPT. 26, 1962	10 00 14.969	
VH	C3	.52194709 00	INC	LAN	APF	.15175261 03	RCA	
TA	EA	.16056169 02	MA	SLR	APD	.45504740 09	TFP	
WX	WY	.16377871 00	WZ	DAI	RAI	.35700551 03	MTA	
QX	QY	.98512302 00	QZ	PX	PY	.52048865-01	PZ	
SXI	SYI	.52048865-01	SZI	RX	RY	.44882108-02	RZ	
BX	BY	.98512307 00	BZ	TX	TY	.99863446 00	TZ	
B.T	B.R	.40694422 08	B	MX	MY	.89241447 00	MZ	
				PER	DEF			

SELENCENTRIC

EPOCH OF PERICENTER		PASSAGE	CONIC		ORBITAL B.T. AND B.R.		EQUATORIAL COORDINATES	
SMA	ECC		JULIAN DATE	2437933.91683991	APF	SEPT. 26, 1962	10 00 14.969	
VH	C3	.52194709 00	INC	LAN	APF	.15175261 03	RCA	
TA	EA	.16056169 02	MA	SLR	APD	.45504740 09	TFP	
WX	WY	.16377871 00	WZ	DAI	RAI	.35700551 03	MTA	
QX	QY	.98512302 00	QZ	PX	PY	.52048865-01	PZ	
SXI	SYI	.52048865-01	SZI	RX	RY	.44882108-02	RZ	
BX	BY	.98512307 00	BZ	TX	TY	.99863446 00	TZ	
B.T	B.R	.40694422 08	B	MX	MY	.89241447 00	MZ	
				PER	DEF			

0 DAYS 7 HRS. 25 MIN. 28.000 SEC.

GEOCENTRIC

EPOCH OF PERICENTER		PASSAGE	CONIC		ORBITAL B.T. AND B.R.		EQUATORIAL COORDINATES	
SMA	ECC		JULIAN DATE	2437933.91683991	APF	SEPT. 26, 1962	10 00 14.969	
VH	C3	.52194709 00	INC	LAN	APF	.15175261 03	RCA	
TA	EA	.16056169 02	MA	SLR	APD	.45504740 09	TFP	
WX	WY	.16377871 00	WZ	DAI	RAI	.35700551 03	MTA	
QX	QY	.98512302 00	QZ	PX	PY	.52048865-01	PZ	
SXI	SYI	.52048865-01	SZI	RX	RY	.44882108-02	RZ	
BX	BY	.98512307 00	BZ	TX	TY	.99863446 00	TZ	
B.T	B.R	.40694422 08	B	MX	MY	.89241447 00	MZ	
				PER	DEF			

GEOCENTRIC

EPOCH OF PERICENTER		PASSAGE	CONIC		ORBITAL B.T. AND B.R.		EQUATORIAL COORDINATES	
SMA	ECC		JULIAN DATE	2437933.91683991	APF	SEPT. 26, 1962	10 00 14.969	
VH	C3	.52194709 00	INC	LAN	APF	.15175261 03	RCA	
TA	EA	.16056169 02	MA	SLR	APD	.45504740 09	TFP	
WX	WY	.16377871 00	WZ	DAI	RAI	.35700551 03	MTA	
QX	QY	.98512302 00	QZ	PX	PY	.52048865-01	PZ	
SXI	SYI	.52048865-01	SZI	RX	RY	.44882108-02	RZ	
BX	BY	.98512307 00	BZ	TX	TY	.99863446 00	TZ	
B.T	B.R	.40694422 08	B	MX	MY	.89241447 00	MZ	
				PER	DEF			

CASE 1

SPACE TRAJECTORIES

3

HELIOCENTRIC

ECLIPTIC COORDINATES

X	.13480859	09	Y	.63461581	08	Z	-.19394000	05	DX	-.14840290	02	DY	.28799071	02	DZ	-.53780793-01	
R	.14899909	09	LAT	-.74577254-02		LON	.25208862	02	V	.32397895	02	PTH	-.20533743	01	AZ	.90095440	02
XE	.13485415	09	YE	.63376436	08	ZE	.20750000	03	DXE	-.13144366	02	DYE	.26854706	02	DZE	-.92089175-03	
XT	.13479145	09	YT	.63753740	08	ZT	-.14497500	05	DXT	-.14160779	02	DYT	.26761893	02	DZT	.77070593-01	
LTE	.79788917-04		LDE	.25171779	02	LTT	-.55707544-02		LOT	.25313240	02	RST	.14910827	09	VST	.30277591	02
EPS	.92879859	02	ESP	.38308338-01		SEP	.87082296	02	EPM	.15240507	03	EMP	.68486949	01	MEP	.20746221	02
MPS	.11184784	03	MSP	.10444440	00	SMP	.68047762	02	SEM	.10572508	03	EMS	.74133345	02	ESM	.14179264	00
EPT	.15240507	03	ETP	.68486949	01	TEP	.20746221	02	TPS	.11184784	03	TSP	.10444440	00	STP	.68047762	02
SET	.10572508	03	STE	.74133345	02	EST	.14179264	00	RPM	.29270319	06	RPT	.29270319	06	SPN	.89168638	02
SAC	.00000000	00															
GCE	.11542093	03	GCT	.28289590	03	SIP	.11150763	03	CPT	.77055983	02	SIN	.76715773	02			
REP	.98535774	05	VEP	.25806020	01												

HELIOCENTRIC

ECLIPTIC COORDINATES

EPOCH OF PERICENTER PASSAGE		CONIC		ORBITAL B.T AND B.R		ECLIPTIC COORDINATES										
		JULIAN DATE														
SMA	.18135415	09	INC	.95130239-01	2437968.94619231	LAN	.20074083	03	APF	.19788441	03	RCA	.14837339	09	OCT. 31, 1962	10 42 31.016
VH	.22507565	02	C3	-.73180260	03	SLR	.17535632	09	APD	.21433491	09	TFP	-.10715800	07		
TA	-.13416383	02	EA	-.11178339	02	DAI	-.29399695-01		RAI	.38625224	02	MTA	.18000000	03		
WX	-.59170647-03		WY	.15625373-02		PX	.78124532	00	PY	.62422322	00	PZ	-.51310489-03			
QX	-.62422316	00	QY	.78124393	00	RX	-.38197126-03		RY	-.34393359-03		RZ	-.99999944	00		
SXI	.78124532	00	SYI	.62422322	00	SZI	-.51310489-03		TX	.62422358	00	TY	-.78124575	00	TZ	.30261203-04
BX	.62422343	00	BY	-.78124426	00	BZ	.15900825-02		MX	-.42591886	00	MY	.90475984	00	MZ	-.16657422-02
B.T	.17832973	09	B.R	-.27816277	06	B	.17832994	09	PER	.48752473	03	DEF				

SELENOCENTRIC

EQUATORIAL COORDINATES

X	.17140902	05	Y	-.26609648	06	Z	-.12072290	06	DX	-.67951095	00	DY	.19210828	01	DZ	.69040375	00
R	.29270319	06	DEC	-.24358288	02	RA	.27368568	03	V	.21514998	01	PTH	-.74277270	02	AZ	.25204116	03
R	.29270315	06	LAT	-.19733697	00	LON	.19310836	01	VR	.24729806	01	PTR	-.56871898	02	AZR	.26351560	03
LTS	.15113509	06	LNS	.29389710	03	LTE	.28183512	01	LNE	.80824179	01						
ALT	.29096519	06	SHA	-.27148098	06	ALP	.39241978	00	DR	-.20710000	01	DP	.11412411-03	ASD	.34021087	00	
HGE	.26712013	03	SVL	-.11612395	02	HNG	.11232868	03	SIA	.15206486	03						
SAC	.00000000	00															

J MATRIX

ITERATION NUMBER 3

X	Y	Z	DX	DY	DZ	KE	KM	RI04							
.13458271	.07	-.42695344	.06	.67030651	.09	-.17484865	10	-.51716629	.09	-.24677413	.05	.20356955	.02	.88889120	.04
-.42695344	.06	.13584474	.06	-.21254745	.09	-.55497506	.09	.16411358	.09	.78256343	.04	-.64316997	.01	-.28108114	.04
-.69104582	.06	.21903042	.06	-.34433515	.09	-.89809155	.09	.26555853	.09	.12671252	.05	-.10410846	.02	-.45778470	.04
.67030651	.09	-.34433515	.09	.33394781	.12	.87091327	12	-.25760137	12	.12290704	.08	.10103704	.05	-.44512218	.07
.17484865	.10	-.55497506	.09	-.89809155	.09	.87091327	12	.22724525	13	-.67197388	12	.32057156	.08	.26367153	.05
-.51716629	.09	.16411358	.09	.26555853	.09	-.25760137	12	.67197388	12	.19875959	12	.94819376	.07	-.77950870	.04
-.24677413	.05	.78256343	.04	.12671252	.05	.12290704	.08	.94819376	.07	.45269174	.03	.37599758	.00	-.16215966	.03
.20356955	.02	-.64316997	.01	-.10410846	.02	.10103704	.05	.26367153	.05	-.77950870	.04	.40375378	-.01	.10492516	.00
.88889120	.04	-.28108114	.04	.45778470	.04	.44512218	.07	.11568369	.08	-.34385678	.07	.16215966	.03	.38400114	.03
.14583833	.06	-.28108114	.04	.45778470	.04	.73458200	.08	.17522160	.09	-.55514334	.08	.27989832	.04	.26620280	.04
.21731702	.07	-.67939742	.06	-.11193366	.07	.10911930	.10	.28117092	.10	-.83890432	.09	-.39536740	.05	.23097192	.02
-.10909485	.05	.34784936	.04	.55564518	.04	.53688231	.07	.14142491	.08	.41474010	.07	.20310117	.03	-.25137313	.00
-.67939742	.06	.21681498	.06	.34632125	.06	-.33462260	.09	-.88148099	.09	.25849706	.09	.12658791	.05	-.15662048	.02
.74153486	.06	-.23608852	.06	-.37784806	.06	.36525572	.09	.96099065	.09	-.28200611	.09	-.13811942	.05	.17397516	.02

LD05

LA05

RI05

LC04

LAC4

X	.14583833	.06	.21731702	.07	-.10909485	.05	-.67996711	.06	.74153486	.06
Y	-.38508051	.05	-.67999742	.06	.34784936	.04	.21681498	.06	-.237608852	.06
Z	-.71378618	.05	-.11193366	.07	.55564518	.04	.34632125	.06	-.37784806	.06
DX	.73458200	.08	.10911930	.10	-.53688231	.07	-.33462260	.09	.36525572	.09
DY	.17522160	.09	.28117092	.10	-.14142491	.08	.98148099	.09	.96099065	.09
DZ	-.55514334	.08	-.83890432	.09	.41474010	.07	.25849706	.09	-.28200611	.09
KE	-.27989832	.04	-.39536740	.05	.20310117	.03	.12658791	.05	-.13811942	.05
KM	.38591045	.01	.23097192	.02	-.25137313	.00	-.15662048	.02	.17397516	.02
RI04	.26620280	.04	.21163676	.05	.00000000	.00	.00000000	.00	.00000000	.00
LA04	.14397314	.07	.58142246	.06	.00000000	.00	.00000000	.00	.00000000	.00
L004	.58142246	.06	.69952251	.07	.00000000	.00	.00000000	.00	.00000000	.00
RI05	-.00000000	.00	-.00000000	.00	.52221388	.03	.15240347	.05	-.16328309	.05
LAC5	-.00000000	.00	-.00000000	.00	.15240347	.05	.19502564	.07	-.10170301	.07
RI05	.00000000	.00	.00000000	.00	-.16328309	.05	-.10170301	.07	.21490256	.07

RA-5 DATA WITH PHYSICAL CONSTANTS 29 MAR 63

ITERATION	NUMBER	3	EPOCH	62/10/16	173723.000	CLOCK	184340	SOS	.69809	01	QSOS	.78186	01	DQ (NOM)
C														
X		.38345409	-.04	.12150873	.00	.58072045	.04	.58072046	.04	.57878923	.04	.19312378	.02	
Y		-.51871966	-.03	.61548643	.00	-.18712691	.04	-.18712696	.04	-.18580354	.04	-.13234238	.02	
Z		-.82820752	-.03	.11875530	.01	-.28917841	.04	-.28917849	.04	-.28846691	.04	-.71158752	.01	
DX		-.58494378	-.06	.12174419	-.02	.36254799	.01	.36254794	.01	.35637715	.01	.61707824	-.01	
DY		-.49989661	-.06	.68093622	-.03	.97646341	.01	.97646336	.01	.97845944	.01	-.19960761	-.01	
DZ		-.74291176	-.06	.18081599	-.02	-.28587345	.01	-.28587352	.01	-.28486888	.01	-.10046452	-.01	
KE		.10392483	-.02	.38332085	.01	.39860005	.06	.39860005	.06	.39860012	.06	-.66406250	-.01	
KM		-.93224259	-.05	.49997383	.01	.49007604	.04	.49007604	.04	.49007589	.04	.14038086	-.02	
RI	4	.38381816	-.04	.59906809	-.01	.63726097	.04	.63726097	.04	.63726076	.04	.20141602	-.02	
LA		.11962480	-.06	.99100249	-.03	-.31212329	.02	-.31212329	.02	-.31212360	.02	.30517578	-.04	
LC		.10190757	-.05	.97973610	-.03	.13688621	.03	.13688621	.03	.13688617	.03	.38146573	-.04	
STA	5													
RI		-.27632297	-.05	.59837643	-.01	.63754971	.04	.63754971	.04	.63754947	.04	.23803711	-.02	
LA		-.22363757	-.06	.99706403	-.03	-.25734780	.02	-.25734780	.02	-.25734820	.02	.39339066	-.04	
LC		-.21766378	-.06	.97883745	-.03	.27684755	.02	.27684755	.02	.27684780	.02	-.25272369	-.04	

3

J INVERSE

ITERATION NUMBER

X	Y	Z	DX	DY	DZ	KE	KM	R104
.14764372-01	.12133066-01	.32046576-01	.34204017-04	.18074241-04	.81292810-04	.20391675 00	-.27649536-02	.11288408-02
.12133066-01	.37882355 00	.69408379 00	.62127899-03	.40216185-03	.88521368-03	.15001394 01	-.39016967-01	-.11485511-02
.32046576-01	.69408379 00	.14102823 01	.13862572-02	.80495197-03	.20125665-02	.27768874 01	-.74956287-01	.31840237-02
.34204017-04	.62127899-03	.13862572-02	.14821648-05	.77838174-06	.21499007-05	.26652212-02	-.67547600-04	.77406520-05
.18074241-04	.40216185-03	.80495197-03	.77838174-06	.46367414-06	.11422535-05	.15577744-02	-.41946636-04	.14039659-05
.81292810-04	.88521368-03	.20125665-02	.21499007-05	.11422535-05	.32694424-05	.36012987-02	-.10523597-03	.14375357-04
.20391675 00	.15001394 01	.27768874 01	.26652212-02	.15577744-02	.36012987-02	.14693488 02	.43016005-01	.20345894-02
-.27649536-02	.39016967-01	-.74956287-01	-.67547600-04	-.41946636-04	-.10523597-03	.43016005-01	.24997383 02	-.37514658-04
.11288408-02	-.11485511-02	.31840237-02	.77406520-05	.14039659-05	.14375357-04	.20345894-02	-.37514658-04	.35888258-02
.64921410-05	.95787267-04	-.10712261-03	.45808345-07	-.49489806-07	.71638385-08	.11604473-03	-.18836405-05	-.38697642-06
.17821332-04	.20711727-03	.44092367-03	.38797852-06	.27904520-06	.74407486-06	-.15673334-03	.96496817-05	-.94684862-09
.14240673-02	.46162228-02	.13476359-01	.15716320-04	.76274993-05	.28133621-04	-.34468520-02	.52224820-04	.24265958-05
.24765957-04	.79823242-04	.23336013-03	.27221903-06	.13211916-06	.48779286-06	-.60260862-04	.78062734-06	.55369127-07
-.22069476-04	-.88286459-04	-.25443635-03	-.30110952-06	-.51455739-06	-.51455739-06	.54655159-04	-.79384651-05	.21584615-06

LA04	LC04	R105	LA05	LO05
.64921410-05	.17821332-04	.14240673-02	.24765957-04	-.22069476-04
-.95787267-04	.20711727-03	.46162228-02	.79823242-04	-.88286459-04
-.10712261-03	.44092367-03	.13476359-01	.23336013-03	-.25443635-03
-.45808345-07	.38797852-06	.15716320-04	.27221903-06	-.30110952-06
-.49489806-07	.27904520-06	.76274993-05	.13211916-06	-.14157366-06
.71638385-08	.74407486-06	.28133621-04	.48779286-06	-.51455739-06
.11604473-03	-.15673334-03	.34468520-02	-.60260862-04	.54655159-04
-.18836405-05	.96496817-05	.52224820-04	.78062734-06	-.79384651-05
-.38697642-06	-.94684862-09	.24265958-05	.55369127-07	.21584615-06
.98208596-06	.31229541-08	.35150149-06	.65444070-08	.10230792-07
.31229541-08	.95988285-06	-.30097933-06	-.45436834-08	.35015982-07
.35150149-06	-.30097933-06	.35805436-02	.33679265-06	-.96466709-07
.65444070-08	-.45436834-08	-.33679265-06	.99413668-06	-.25765525-08
.10230792-07	.35015982-07	-.96466709-07	-.25765525-08	.95812277-06

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COVARIANCE MATRIX OF ESTIMATED PARAMETERS

	X	Y	Z	DX	DY	DZ	KE	KM	RI04
X	.14764372-01	.12133066-01	.32046576-01	.34204017-04	.18074241-04	.81292810-04	.20391675 00	-.27649536-02	.11288408-02
Y	.12133066-01	.37882355 00	.69408379 00	.62127899-03	.40216185-03	.88521368-03	.15001394 01	-.39016967-01	-.11485511-02
Z	.32046576-01	.69408379 00	.14102823 01	.13862572-02	.80495197-03	.20125665-02	.27768874 01	-.74956287-01	.31840237-02
DX	.34204017-04	.62127899-03	.13862572-02	.14821648-05	.77838174-06	.21499007-05	.26652212-02	-.67547600-04	.77406520-05
DY	.18074241-04	.40216185-03	.80495197-03	.77838174-06	.46367414-06	.11422535-05	.15577744-02	-.41946636-04	.14039659-05
DZ	.81292810-04	.88521368-03	.20125665-02	.21499007-05	.11422535-05	.32694424-05	.36012987-02	-.10523597-03	.14375357-04
KE	.20391675 00	.15001394 01	.27768874 01	.26652212-02	.15577744-02	.36012987-02	.14693488 02	.43016005-01	.20345894-02
KM	-.27649536-02	-.39016967-01	-.74956287-01	-.67547600-04	-.41946636-04	-.10523597-03	.43016005-01	.24997383 02	-.37514658-04
RI04	.11288408-02	-.11485511-02	.31840237-02	.77406520-05	.14039659-05	.14375357-04	.20345894-02	-.37514658-04	.35888258-02
LA04	.64921410-05	-.95787267-04	-.10712261-03	-.45808345-07	-.49489806-07	.71638385-08	.11604473-03	-.18836405-05	-.38697642-06
LOC4	.17821332-04	.20711727-03	.44032967-03	.39797852-06	.27904520-06	.74407486-06	-.15673334-03	.96496817-05	-.94684862-09
RI05	.14240673-02	.46162228-02	.13476359-01	.15716320-04	.76274993-05	.28133621-04	-.34468520-02	.52224820-04	.24265958-05
LA05	.24765557-04	.79823242-04	.27221903-06	.27221903-06	.13211916-06	.48779286-06	-.60260862-04	.78062734-06	.55369127-07
LO05	-.22069476-04	-.88286459-04	-.25443635-03	-.30110952-06	-.14157366-06	-.51455739-06	.54655159-04	-.79384651-05	.21584615-06

	LA04	LCC4	RI05	LA05	LO05
X	.64921410-05	.17821332-04	.14240673-02	.24765557-04	-.22069476-04
Y	-.95787267-04	.20711727-03	.46162228-02	.79823242-04	-.88286459-04
Z	-.10712261-03	.44032967-03	.13476359-01	.27221903-06	-.30110952-06
DX	-.45808345-07	.39797852-06	.15716320-04	.27221903-06	-.30110952-06
DY	-.49489806-07	.27904520-06	.76274993-05	.13211916-06	-.14157366-06
DZ	.71638385-08	.74407486-06	.28133621-04	.48779286-06	-.51455739-06
KE	.11604473-03	-.15673334-03	-.34468520-02	-.60260862-04	.54655159-04
KM	-.18836405-05	.96496817-05	.52224820-04	.78062734-06	-.79384651-05
RI04	-.38697642-06	-.94684862-09	.24265958-05	.55369127-07	.21584615-06
LA04	.98208596-06	.31229541-08	.35150149-06	.65444070-08	.10230792-07
LOC4	.31229541-08	.95988285-06	-.30097933-06	-.45436834-08	.35015982-07
RI05	.35150149-06	-.30097933-06	.35805436-02	-.33679265-06	-.96466709-07
LA05	.65444070-08	-.45436834-08	.33679265-06	.99413668-06	-.25765525-08
LO05	.10230792-07	.35015982-07	-.95466709-07	-.25765525-08	.95812277-06

CORRELATION MATRIX OF ESTIMATED PARAMETERS

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ITERATION NUMBER

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	X	Y	Z	DX	DY	DZ	KE	KM	RI04
X	.10000000	.16223501	.22208597	.23121786	.21844703	.37000518	.43780725	-.45512751	.15507759
Y	.16223501	.10000000	.94959932	.82912485	.95956843	.79541320	.63584415	-.12679080	-.31149828
Z	.22208597	.94959932	.10000000	.95883207	.99542952	.93726063	.61001821	-.12624314	.44755569
DX	.23121786	.82912485	.95883207	.10000000	.93894023	.97663732	.57111367	-.11097225	.10613365
DY	.21844703	.95956843	.99542952	.93894023	.10000000	.92772487	.59680942	-.12320928	.34417071
DZ	.37000518	.79541320	.93726063	.97663732	.92772487	.10000000	.51958890	-.11640726	.13271060
KE	.43780725	.63584415	.61001821	.57111367	.59680942	.51958890	.10000000	.22445039	.88600897
KM	-.45512751	-.12679080	-.12624314	-.11097225	-.12320928	-.11640726	.22445039	.10000000	-.12524994
RI04	.15507759	-.31149828	.44755569	.10613365	.34417071	.13271060	.88600897	-.12524994	.10000000
LA04	.53914515	-.15704154	.34346992	.37897206	.32527472	.41827220	.39979208	.42002068	.19699563
LA05	.19586127	.12534118	.18964661	.21573874	.18719802	.26002452	.15027464	.17456421	.67693467
LA05	.20441726	.13007320	.19708364	.22425761	.19459708	.27056745	.15767028	.15659339	.92697588
LA05	.18555555	.14970060	.19586127	.20441726	.15767028	.29072769	.14566598	.16221040	.36809298
LA05	.53914515	.14970060	.19586127	.20441726	.15767028	.29072769	.14566598	.16221040	.36809298
X	.53914515	.14970060	.19586127	.20441726	.15767028	.29072769	.14566598	.16221040	.36809298
Y	.14970060	.19586127	.20441726	.15767028	.15659339	.92697588	.36809298	.10546878	.10546878
Z	.19586127	.20441726	.15767028	.15659339	.92697588	.36809298	.10546878	.10546878	.10546878
DX	.20441726	.15767028	.15659339	.92697588	.36809298	.10546878	.10546878	.10546878	.10546878
DY	.15767028	.15659339	.92697588	.36809298	.10546878	.10546878	.10546878	.10546878	.10546878
DZ	.15659339	.92697588	.36809298	.10546878	.10546878	.10546878	.10546878	.10546878	.10546878
KE	.30548383	-.41733981	.15027464	.15767028	.14566598	.16221040	.36809298	.10546878	.10546878
KM	-.38016838	.19699563	.17456421	.15659339	.92697588	.36809298	.10546878	.10546878	.10546878
RI04	-.65182882	-.16132261	.67693467	.92697588	.36809298	.10546878	.10546878	.10546878	.10546878
LA04	.10000000	.32164865	.59275871	.66232706	.46513165	.36512924	.16469954	.26400087	.26400087
LA05	.32164865	.59275871	.66232706	.46513165	.36512924	.16469954	.26400087	.26400087	.26400087
LA05	.59275871	.66232706	.46513165	.36512924	.16469954	.26400087	.26400087	.26400087	.26400087
LA05	.66232706	.46513165	.36512924	.16469954	.26400087	.26400087	.26400087	.26400087	.26400087
LA05	.10546878	.10546878	.10546878	.10546878	.10546878	.10546878	.10546878	.10546878	.10546878

TIME	STATION	TC	Q	FRQ	4	62/10/18	ITERATION	NUMBER	3	PASS	NUMBER	10/181	PAGE	1
						DEC			HA				CC3	
183926	50	4	8912.9		.15735415	01 .101 00	-.0285*	.35402323	03 .101 00	-.0144*	.13121357	06 .182 00	.0078	
183951	50	4	8912.9		.16917202	01 .101 00	-.0287*	.35391487	03 .101 00	-.0320*	.13107382	06 .182 00	.0156	
184026	50	4	8912.9		.18072722	01 .101 00	-.0283*	.35381679	03 .101 00	-.0280*	.13093559	06 .182 00	.0117	
184126	50	4	8912.9		.19202983	01 .101 00	-.0274*	.35372853	03 .101 00	-.0337*	.13079889	06 .182 00	.0039	
184151	50	4	8912.9		.20308933	01 .101 00	-.0260*	.35364962	03 .101 00	-.0427*	.13066378	06 .182 00	.0000	
184226	50	4	8912.9		.21391449	01 .101 00	-.0263*	.35357963	03 .101 00	-.0048*	.13053025	06 .182 00	.0254	
184251	50	4	8912.9		.22451387	01 .101 00	-.0303*	.35351818	03 .101 00	-.0094*	.13039834	06 .182 00	-.0186	
184326	50	4	8912.9		.23489539	01 .101 00	-.0321*	.35346488	03 .101 00	.0438*	.13026804	06 .182 00	.0010	
184351	50	4	8912.9		.24506708	01 .101 00	-.0338*	.35341938	03 .101 00	.0314*	.13013936	06 .182 00	.0010	
184426	50	4	8912.9		.25503593	01 .101 00	-.0196*	.35338136	03 .101 00	-.0546*	.13001230	06 .182 00	-.0205	
184451	50	4	8912.9		.26480894	01 .101 00	-.0213*	.35335049	03 .101 00	-.0238*	.12988686	06 .182 00	-.0195	
184526	50	4	8912.9		.27439268	01 .101 00	-.0212*	.35332650	03 .101 00	-.0038*	.12976303	06 .182 00	.0098	
184551	50	4	8912.9		.28379365	01 .101 00	-.0192*	.35330909	03 .101 00	-.0264*	.12964080	06 .182 00	-.0039	
184626	50	4	8912.9		.29301755	01 .101 00	-.0174*	.35329802	03 .101 00	-.0154*	.12952017	06 .182 00	-.0078	
184651	50	4	8912.9		.30207027	01 .101 00	-.0159*	.35329302	03 .101 00	-.0425*	.12940111	06 .182 00	-.0127	
184726	50	4	8912.9		.31095728	01 .101 00	-.0168*	.35329388	03 .101 00	-.0433*	.12928362	06 .182 00	-.0205	
184751	50	4	8912.9		.31968379	01 .101 00	-.0281*	.35330035	03 .101 00	.0640*	.12916768	06 .182 00	.0010	
184826	50	4	8912.9		.32825481	01 .101 00	-.0218*	.35331224	03 .101 00	-.0019*	.12905327	06 .182 00	-.0068	
184851	50	4	8912.9		.33667506	01 .101 00	-.0200*	.35332935	03 .101 00	-.0210*	.12894037	06 .182 00	-.0127	
184926	50	4	8912.9		.34494904	01 .101 00	-.0187*	.35335147	03 .101 00	-.0432*	.12882897	06 .182 00	.0283	
184951	50	4	8912.9		.35308121	01 .101 00	-.0181*	.35337845	03 .101 00	-.0623*	.12871905	06 .182 00	-.0078	
185026	50	4	8912.9		.56739149	01 .101 00	-.0203*	.35631000	03 .101 00	-.0769*	.12571637	06 .183 00	.0244	
185051	50	4	8912.9		.59152952	01 .101 00	-.0195*	.35696676	03 .101 00	-.0303*	.12537175	06 .183 00	.0303	
185126	50	4	8912.9		.59619076	01 .101 00	-.0200*	.35710292	03 .101 00	-.0326*	.12530519	06 .183 00	-.0088	
185151	50	4	8912.9		.60986073	01 .101 00	-.0345*	.35752034	03 .101 00	-.0164*	.12511001	06 .183 00	.0127	
185226	50	4	8912.9		.61431611	01 .101 00	-.0251*	.35766235	03 .101 00		.12504641	06 .183 00	.0322	
185251	50	4	8912.9		.61872251	01 .101 00	-.0111*	.35780577	03 .101 00	-.0240*	.12498352	06 .183 00	.0000	

TIME	TC	Q	FRQ	NUMBER	4	62/10/18	ITERATION	NUMBER	3	PASS	NUMBER	10/181	PAGE	2	
															CC3
															HA
194526	50	4	8276.5	.62308068	01	.101 00	-.0526*	.35795052	03	.101 00	-.0330*	.12492133	06	.183 00	.0068
194551	50	4	8276.5	.62308068	01	.101 00	-.0526*	.35795052	03	.101 00	-.0330*	.12492133	06	.183 00	.0068
194626	50	4	8276.5	.62739139	01	.101 00	-.0077*	.35809663	03	.101 00	-.0312*	.12485984	06	.183 00	.0039
194651	50	4	8276.5	.62739139	01	.101 00	-.0077*	.35809663	03	.101 00	-.0312*	.12485984	06	.183 00	.0039
194726	50	4	8276.5	.63165575	01	.101 00	-.0323*	.35824401	03	.101 00	-.0406*	.12479902	06	.183 00	.0020
194751	50	4	8276.5	.63165575	01	.101 00	-.0323*	.35824401	03	.101 00	-.0406*	.12479902	06	.183 00	.0020
194826	50	4	8276.5	.63587463	01	.101 00	-.0304*	.35839267	03	.101 00	-.0354*	.12473887	06	.183 00	.0127
194851	50	4	8276.5	.63587463	01	.101 00	-.0304*	.35839267	03	.101 00	-.0354*	.12473887	06	.183 00	.0127
194926	50	4	8276.5	.64004871	01	.101 00	-.0101*	.35854259	03	.101 00	-.0475*	.12467937	06	.183 00	.0244
194951	50	4	8276.5	.64004871	01	.101 00	-.0101*	.35854259	03	.101 00	-.0475*	.12467937	06	.183 00	.0244
195026	50	4	8276.5	.64417873	01	.101 00	-.0454*	.35869372	03	.101 00	-.0527*	.12462053	06	.183 00	.0088
195051	50	4	8276.5	.64417873	01	.101 00	-.0454*	.35869372	03	.101 00	-.0527*	.12462053	06	.183 00	.0088
195126	50	4	8276.5	.64826565	01	.101 00	-.0262*	.35884606	03	.101 00	-.0372*	.12456232	06	.183 00	.0557
195151	50	4	8276.5	.64826565	01	.101 00	-.0262*	.35884606	03	.101 00	-.0372*	.12456232	06	.183 00	.0557
195226	50	4	8276.5	.65230998	01	.101 00	-.0245*	.35899955	03	.101 00	-.0388*	.12450475	06	.183 00	-.0078
195251	50	4	8276.5	.65230998	01	.101 00	-.0245*	.35899955	03	.101 00	-.0388*	.12450475	06	.183 00	-.0078
195326	50	4	8276.5	.65631265	01	.101 00	-.0365*	.35915421	03	.101 00	-.0396*	.12444779	06	.183 00	-.0283
195351	50	4	8276.5	.65631265	01	.101 00	-.0365*	.35915421	03	.101 00	-.0396*	.12444779	06	.183 00	-.0283
195426	50	4	8276.5	.66027419	01	.101 00	-.0241*	.35930998	03	.101 00	-.0375*	.12439144	06	.183 00	.0215
195451	50	4	8276.5	.66027419	01	.101 00	-.0241*	.35930998	03	.101 00	-.0375*	.12439144	06	.183 00	.0215
195526	50	4	8276.5	.66419552	01	.101 00	-.0313*	.35946685	03	.101 00	-.0425*	.12433569	06	.183 00	.0098
195551	50	4	8276.5	.66419552	01	.101 00	-.0313*	.35946685	03	.101 00	-.0425*	.12433569	06	.183 00	.0098
195626	50	4	8276.5	.66807717	01	.101 00	-.0300*	.35962481	03	.101 00	-.0406*	.12428053	06	.183 00	.0059
195651	50	4	8276.5	.66807717	01	.101 00	-.0300*	.35962481	03	.101 00	-.0406*	.12428053	06	.183 00	.0059
195726	50	4	8276.5	.67191988	01	.101 00	-.0144*	.35978383	03	.101 00	-.0377*	.12422596	06	.183 00	-.0176
195751	50	4	8276.5	.67191988	01	.101 00	-.0144*	.35978383	03	.101 00	-.0377*	.12422596	06	.183 00	-.0176
195826	50	4	8276.5	.68322055	01	.101 00	-.0232*	.26703244	00	.101 00	-.0314*	.12417196	06	.183 00	.0039
195851	50	4	8276.5	.68322055	01	.101 00	-.0232*	.26703244	00	.101 00	-.0314*	.12417196	06	.183 00	.0039
195926	50	4	8276.5	.68691364	01	.101 00	-.0141*	.43008431	00	.101 00	-.0365*	.12411852	06	.183 00	-.0010
195951	50	4	8276.5	.68691364	01	.101 00	-.0141*	.43008431	00	.101 00	-.0365*	.12411852	06	.183 00	-.0010
200026	50	4	8276.5	.69057078	01	.101 00	-.0206*	.59410468	00	.101 00	-.0427*	.12391027	06	.183 00	.0303
200051	50	4	8276.5	.69057078	01	.101 00	-.0206*	.59410468	00	.101 00	-.0427*	.12391027	06	.183 00	.0303
200126	50	4	8276.5	.69419266	01	.101 00	-.0247*	.75906304	00	.101 00	-.0417*	.12385954	06	.183 00	-.0020
200151	50	4	8276.5	.69419266	01	.101 00	-.0247*	.75906304	00	.101 00	-.0417*	.12385954	06	.183 00	-.0020
200226	50	4	8276.5	.69777972	01	.101 00	-.0225*	.92494795	00	.101 00	-.0358*	.12380933	06	.183 00	.0107
200251	50	4	8276.5	.69777972	01	.101 00	-.0225*	.92494795	00	.101 00	-.0358*	.12380933	06	.183 00	.0107
200326	50	4	8276.5	.70133263	01	.101 00	-.0280*	.10917442	01	.101 00	-.0327*	.12375963	06	.183 00	.0303
200351	50	4	8276.5	.70133263	01	.101 00	-.0280*	.10917442	01	.101 00	-.0327*	.12375963	06	.183 00	.0303
200426	50	4	8276.5	.70485191	01	.101 00	-.0251*	.12594326	01	.101 00	-.0345*	.12371043	06	.183 00	-.0117
200451	50	4	8276.5	.70485191	01	.101 00	-.0251*	.12594326	01	.101 00	-.0345*	.12371043	06	.183 00	-.0117
200526	50	4	8276.5	.70833379	01	.101 00	-.0299*	.14280018	01	.101 00	-.0332*	.12366173	06	.183 00	-.0107
200551	50	4	8276.5	.70833379	01	.101 00	-.0299*	.14280018	01	.101 00	-.0332*	.12366173	06	.183 00	-.0107
200626	50	4	8276.5	.71179144	01	.101 00	-.0284*	.15974252	01	.101 00	-.0408*	.12361352	06	.183 00	.0205
200651	50	4	8276.5	.71179144	01	.101 00	-.0284*	.15974252	01	.101 00	-.0408*	.12361352	06	.183 00	.0205
200726	50	4	8276.5	.71521272	01	.101 00	-.0245*	.17676950	01	.101 00	-.0411*	.12356579	06	.183 00	.0107
200751	50	4	8276.5	.71521272	01	.101 00	-.0245*	.17676950	01	.101 00	-.0411*	.12356579	06	.183 00	.0107
200826	50	4	8276.5	.71860231	01	.101 00	-.0164*	.19387998	01	.102 00	-.0425*	.12351853	06	.183 00	.0039
200851	50	4	8276.5	.71860231	01	.101 00	-.0164*	.19387998	01	.102 00	-.0425*	.12351853	06	.183 00	.0039
200926	50	4	8276.5	.72196075	01	.101 00	-.0139*	.21107129	01	.102 00	-.0425*	.12347175	06	.183 00	.0098
200951	50	4	8276.5	.72196075	01	.101 00	-.0139*	.21107129	01	.102 00	-.0425*	.12347175	06	.183 00	.0098
201026	50	4	8276.5	.72528855	01	.101 00	-.0211*	.22834344	01	.102 00	-.0353*				
201051	50	4	8276.5	.72528855	01	.101 00	-.0211*	.22834344	01	.102 00	-.0353*				
201126	50	4	8276.5												
201151	50	4	8276.5												
201226	50	4	8276.5												
201251	50	4	8276.5												

TIME	STATION	IC	Q	FRQ	4	62/10/18	ITERATION	NUMBER	3	PASS	NUMBER	10/181	PAGE	3
						DEC			HA				CC3	
201326	50	4	8276.5		.72858595	01 .101 00	-.0220*	.24569375	01 .102 00	-.0430*		.12342543	06 .183 00	.0117
201351	50	4	8276.5		.73185363	01 .101 00	-.0246*	.26312108	01 .102 00	-.0333*		.12337956	06 .183 00	-.0020
201426	50	4	8276.5		.73509195	01 .101 00	-.0289*	.28062505	01 .102 00	-.0386*		.12333414	06 .183 00	-.0049
201526	50	4	8276.5		.73830125	01 .101 00	-.0289*	.29820337	01 .102 00	-.0405*		.12328917	06 .183 00	-.0068
201626	50	4	8276.5		.74148202	01 .101 00	-.0167*	.31585527	01 .102 00	-.0371*		.12324464	06 .183 00	-.0176
201726	50	4	8276.5		.74463479	01 .101 00	-.0281*	.33357924	01 .102 00	-.0444*		.12320053	06 .183 00	.0059
201751	50	4	8276.5		.75998999	01 .101 00	-.0313*	.42323995	01 .102 00	-.0378*		.12298629	06 .183 00	.0088
201851	50	4	8276.5		.76298206	01 .101 00	-.0292*	.44137264	01 .102 00	-.0453*		.12294466	06 .183 00	-.0186
202326	50	4	8276.5		.76889005	01 .101 00	-.0321*	.47782904	01 .102 00	-.0541*		.12286257	06 .183 00	.0117
202451	50	4	8276.5		.77180672	01 .101 00	-.0212*	.49615046	01 .102 00	-.0454*		.12282210	06 .183 00	.0010
202626	50	4	8276.5		.77469889	01 .101 00	-.0100*	.51453364	01 .102 00	-.0474*		.12278201	06 .183 00	-.0273
202726	50	4	8276.5		.77756698	01 .101 00	-.0286*	.53297705	01 .102 00	-.0640*		.12274229	06 .183 00	-.0488
202851	50	4	8276.5		.78323184	01 .101 00	-.0111*	.57004002	01 .102 00	-.0828*		.12266395	06 .183 00	-.0107
202926	50	4	8276.5		.78602940	01 .101 00	-.0290*	.58865806	01 .102 00	-.0713*		.12262532	06 .183 00	-.0029
203126	50	4	8276.5		.78880405	01 .101 00	-.0366*	.60733290	01 .102 00	-.0640*		.12258705	06 .183 00	-.0469
203151	50	4	8276.5		.79155608	01 .101 00	-.0141*	.62606263	01 .102 00	-.0535*		.12254912	06 .183 00	-.0430
203226	50	4	8276.5		.79428583	01 .101 00	-.0153*	.64484765	01 .102 00	-.0754*		.12251154	06 .183 00	-.0420
203326	50	4	8276.5		.79699352	01 .101 00	-.0223*	.66368642	01 .102 00	-.0801*		.12247430	06 .183 00	-.0420
203351	50	4	8276.5		.79967945	01 .101 00	-.0110*	.68257818	01 .102 00	-.0652*		.12243740	06 .183 00	-.0195
203426	50	4	8276.5		.80234393	01 .101 00	-.0336*	.70152256	01 .102 00	-.0767*		.12240083	06 .183 00	-.0088
203451	50	4	8276.5		.80498725	01 .101 00	-.0039*	.72051802	01 .102 00	-.0608*		.12236458	06 .183 00	.0342
203526	50	4	8276.5		.80760953	01 .101 00	-.0301*	.73956455	01 .102 00	-.0654*		.12232866	06 .183 00	-.0059
203626	50	4	8276.5		.81021117	01 .101 00	-.0280*	.75866103	01 .102 00	-.0725*		.12229307	06 .183 00	-.0273
203726	50	4	8276.5		.81279247	01 .101 00	-.0217*	.77780631	01 .102 00	-.0681*		.12225778	06 .183 00	-.0439
203751	50	4	8276.5		.81535352	01 .101 00	-.0233*	.79700039	01 .102 00	-.0801*		.12222281	06 .183 00	-.0332
203826	50	4	8276.5		.81789467	01 .101 00	-.0365*	.81624211	01 .102 00	-.0867*		.12218815	06 .183 00	-.0498
203851	50	4	8276.5		.82041617	01 .101 00	-.0217*	.83553110	01 .102 00	-.0876*		.12215379	06 .183 00	-.0107

TIME	STATION	TC	Q	FRQ	4	62/10/18	ITERATION	NUMBER	3	PASS	NUMBER	10/181	PAGE	4
						DEC			HA				CC3	
204626	50	4	8276.5		.82291812	01 .101 00	-.0106*	.85486623	01 .102 00	-.1072*		.12211973	06 .184 00	-.0332
204651	50	4	8276.5		.82540092	01 .101 00	-.0253*	.87424746	01 .102 00	-.1072*		.12208597	06 .184 00	.0088
204726	50	4	8276.5		.82786477	01 .101 00	-.0239*	.89367331	01 .102 00	-.0955*		.12205250	06 .184 00	-.0039
204851	50	4	8276.5		.83030990	01 .101 00	-.0242*	.91314338	01 .102 00	-.0784*		.12201933	06 .184 00	-.0068
204926	50	4	8276.5		.83273642	01 .101 00	-.0364*	.93265804	01 .102 00	-.0737*		.12198643	06 .184 00	-.0352
205026	50	4	8276.5		.83514465	01 .101 00	-.0284*	.95221502	01 .102 00	-.0693*		.12195383	06 .184 00	-.0264
205126	50	4	8276.5		.83753467	01 .101 00	-.0162*	.97181506	01 .102 00	-.0835*		.12192150	06 .184 00	.0215
205251	50	4	8276.5		.83990676	01 .101 00	-.0198*	.99145665	01 .102 00	-.0720*		.12188945	06 .184 00	-.0068
205326	50	4	8276.5		.84226134	01 .101 00	-.0192*	.10111394	02 .102 00	-.0830*		.12185767	06 .184 00	-.0068
205351	50	4	8276.5		.84459823	01 .101 00	-.0245*	.10308633	02 .102 00	-.0564*		.12182616	06 .184 00	-.0566
205426	50	4	8276.5		.84691803	01 .101 00	-.0355*	.10506273	02 .102 00	-.0542*		.12179491	06 .184 00	-.0127
205451	50	4	8276.5		.84922074	01 .101 00	-.0165*	.10704309	02 .102 00	-.0464*		.12176393	06 .184 00	-.0127
205526	50	4	8276.5		.85150644	01 .101 00	-.0233*	.10902733	02 .102 00	-.0669*		.12173321	06 .184 00	.0068
205551	50	4	8276.5		.85377540	01 .101 00	-.0218*	.11101547	02 .102 00	-.0558*		.12170275	06 .184 00	-.0107
210026	50	4	8276.5		.85602779	01 .101 00	-.0262*	.11300738	02 .102 00	-.0571*		.12167254	06 .184 00	-.0225
210051	50	4	8276.5		.85826394	01 .101 00	-.0265*	.11500302	02 .102 00	-.0608*		.12164258	06 .184 00	-.0049
210151	50	4	8276.5		.86048394	01 .101 00	-.0126*	.11700240	02 .102 00	-.0490*		.12161288	06 .184 00	.0039
210226	50	4	8276.5		.86268795	01 .101 00	-.0345*	.11900539	02 .102 00	-.0574*		.12158341	06 .184 00	-.0322
210251	50	4	8276.5		.86487606	01 .101 00	.0037*	.12101201	02 .102 00	-.0422*		.12155419	06 .184 00	.0078
210326	50	4	8276.5		.86704864	01 .101 00	-.0179*	.12302214	02 .102 00	-.0553*		.12152521	06 .184 00	-.0107
210351	50	4	8276.5		.86920564	01 .101 00	-.0393*	.12503581	02 .102 00	-.0608*		.12149647	06 .184 00	.0342
210426	50	4	8276.5		.87134743	01 .101 00	-.0206*	.12705287	02 .102 00	-.0487*		.12146795	06 .184 00	.0244
210451	50	4	8276.5		.87347402	01 .101 00	-.0198*	.12907336	02 .102 00	-.0508*		.12143968	06 .184 00	-.0381
210526	50	4	8276.5		.87558573	01 .101 00	-.0268*	.13109724	02 .102 00	-.0574*		.12141163	06 .184 00	.0117
210551	50	4	8276.5		.87768249	01 .101 00	-.0217*	.13312440	02 .102 00	-.0602*		.12138380	06 .184 00	.0352
211126	50	4	8276.5		.87976464	01 .101 00	-.0124*	.13515487	02 .102 00	-.0713*		.12135620	06 .184 00	-.0254
211226	50	4	8276.5		.88183232	01 .101 00	-.0330*	.13718855	02 .102 00	-.0850*		.12132883	06 .184 00	.0127

TIME	STATION		NUMBER	4	62/10/18		ITERATION	NUMBER	3	PASS	NUMBER	10/181	PAGE	5
	TC	Q			DEC	HA								
211326	50	4	8276.5	.88388565	01 .101 00	-.0173*	.13922547	02 .102 00	-.0708*			.12130167	06 .184 00	.0313
211351	50	4	8276.5	.88592462	01 .101 00	-.0216*	.14126546	02 .102 00	-.1008*			.12127472	06 .184 00	.0146
211426	50	4	8276.5	.88794965	01 .101 00	-.0178*	.14330855	02 .102 00	-.0913*			.12124799	06 .184 00	.0049
211526	50	4	8276.5	.88996077	01 .101 00	-.0278*	.14535476	02 .102 00	-.0920*			.12122148	06 .184 00	.0020
211551	50	4	8276.5	.89195809	01 .101 00	-.0096*	.14740395	02 .102 00	-.0811*			.12119517	06 .184 00	-.0088
211626	50	4	8276.5	.89394175	01 .101 00	-.0293*	.14945618	02 .102 00	-.0825*			.12116906	06 .184 00	.0137
211726	50	4	8276.5	.89591189	01 .101 00	-.0488*	.15151131	02 .102 00	-.0881*			.12114317	06 .184 00	.0313
211826	50	4	8276.5	.89981234	01 .101 00	-.0276*	.15563032	02 .102 00	-.1062*			.12109198	06 .184 00	.0244
211926	50	4	8276.5	.90174280	01 .101 00	-.0049*	.15769406	02 .102 00	-.1665*			.12106668	06 .184 00	.0020
212126	50	4	8276.5	.90366036	01 .101 00	-.0239*	.15976066	02 .102 00	-.1475*			.12104157	06 .184 00	.0049
212151	50	4	8276.5	.90556509	01 .101 00	-.0088*	.16182995	02 .102 00	-.0767*			.12101666	06 .184 00	.0352
212226	50	4	8276.5	.90745699	01 .101 00	-.0276*	.16390204	02 .102 00	-.0840*			.12099195	06 .184 00	.0146
212326	50	4	8276.5	.90933364	01 .101 00	.0017*	.16597678	02 .102 00	-.1035*			.12096742	06 .184 00	.0225
212426	50	4	8276.5	.91120333	01 .101 00	-.0148*	.16805423	02 .102 00	-.1372*			.12094307	06 .184 00	.0254
212451	50	4	8276.5	.91305795	01 .101 00	-.0332*	.17013424	02 .102 00	-.1558*			.12091891	06 .184 00	.0049
212526	50	4	8276.5	.91490033	01 .101 00	-.0135*	.17221683	02 .102 00	-.0779*			.12089494	06 .184 00	.0195
212551	50	4	8276.5	.91673055	01 .101 00	-.0256*	.17430209	02 .102 00	-.0825*			.12087115	06 .184 00	-.0068
212626	50	4	8276.5	.91854890	01 .101 00	-.0017*	.17638978	02 .102 00	-.0854*			.12084753	06 .184 00	.0078
212651	50	4	8276.5	.92035527	01 .101 00	-.0197*	.17848003	02 .102 00	-.1167*			.12082409	06 .184 00	.0264
212726	50	4	8276.5	.92214992	01 .101 00	-.0175*	.18057272	02 .102 00	-.1343*			.12080083	06 .184 00	.0303
212751	50	4	8276.5	.92393292	01 .101 00	.0008*	.18266784	02 .102 00	-.1299*			.12077774	06 .184 00	.0010
212826	50	4	8276.5	.92570439	01 .101 00	-.0167*	.18476540	02 .102 00	-.0715*			.12075482	06 .184 00	.0205
212851	50	4	8276.5	.92746447	01 .101 00	-.0342*	.18686529	02 .102 00	-.0718*			.12073207	06 .184 00	.0303
212926	50	4	8276.5	.92921317	01 .101 00	-.0235*	.18896761	02 .102 00	-.0621*			.12070949	06 .184 00	-.0068
213026	50	4	8276.5	.93095057	01 .101 00	-.0187*	.19107217	02 .102 00	-.0568*			.12068707	06 .184 00	.0098
213051	50	4	8276.5	.93267693	01 .101 00	-.0139*	.19317910	02 .102 00	-.0515*			.12066482	06 .184 00	-.0166
213126	50	4	8276.5	.93439244	01 .101 00	-.0249*	.19528824	02 .102 00	-.0725*			.12064272	06 .184 00	.0137

CC3

TIME	STATION	TC	Q	FRQ	NUMBER	4	62/10/18	ITERATION	NUMBER	3	PASS	NUMBER	10/181	PAGE	6
							DEC			HA				CC3	
214126	50	4	8276.5			.93609681	C1 .101 00			.19739958	02 .102 00			.12062079	06 .184 00
214151	50	4	8276.5												
214226	50	4	8276.5			.93779048	C1 .101 00			.19951321	02 .102 00			.12059902	06 .184 00
214251	50	4	8276.5												
214326	50	4	8276.5			.93947345	C1 .101 00			.20162897	02 .102 00			.12057741	06 .184 00
214351	50	4	8276.5												
214426	50	4	8276.5			.94114573	C1 .101 00			.20374694	02 .102 00			.12055595	06 .184 00
214451	50	4	8276.5												
214526	50	4	8276.5			.94280756	C1 .101 00			.20586700	02 .102 00			.12053464	06 .184 00
214551	50	4	8276.5												
214626	50	4	8276.5			.94445895	C1 .101 00			.20798919	02 .102 00			.12051349	06 .184 00
214651	50	4	8276.5												
214726	50	4	8276.5			.94610006	C1 .101 00			.21011344	02 .102 00			.12049248	06 .184 00
214751	50	4	8276.5												
214826	50	4	8276.5			.94773081	C1 .101 00			.21223971	02 .102 00			.12047163	06 .184 00
214851	50	4	8276.5												
214926	50	4	8276.5			.94935153	C1 .101 00			.21436810	02 .102 00			.12045092	06 .185 00
214951	50	4	8276.5												
215026	50	4	8276.5			.95096217	C1 .101 00			.21649844	02 .102 00			.12043035	06 .185 00
215051	50	4	8276.5												
215126	50	4	8276.5			.95256288	C1 .101 00			.21863079	02 .102 00			.12040993	06 .185 00
215151	50	4	8276.5												
215226	50	4	8276.5			.95415355	C1 .101 00			.22076505	02 .102 00			.12038966	06 .185 00
215251	50	4	8276.5												
215326	50	4	8276.5			.95573455	C1 .101 00			.22290132	02 .102 00			.12036952	06 .185 00
215351	50	4	8276.5												
215426	50	4	8276.5			.95730579	C1 .101 00			.22503946	02 .102 00			.12034952	06 .185 00
215451	50	4	8276.5												
215526	50	4	8276.5			.95886750	C1 .101 00			.22717946	02 .102 00			.12032967	06 .185 00
215551	50	4	8276.5												
215626	50	4	8276.5			.96041954	C1 .101 00			.22932141	02 .102 00			.12030994	06 .185 00
215726	50	4	8276.5												
215751	50	4	8276.5			.96196225	C1 .101 00			.23146514	02 .102 00			.12029036	06 .185 00
215826	50	4	8276.5												
215851	50	4	8276.5			.96349546	C1 .101 00			.23361073	02 .102 00			.12027090	06 .185 00
215926	50	4	8276.5												
215951	50	4	8276.5			.96501949	C1 .101 00			.23575811	02 .102 00			.12025158	06 .185 00
220026	50	4	8276.5												
220051	50	4	8276.5			.96653426	C1 .101 00			.23790728	02 .102 00			.12023239	06 .185 00
220126	50	4	8276.5												
220151	50	4	8276.5			.96803987	C1 .101 00			.24005824	02 .102 00			.12021333	06 .185 00
220226	50	4	8276.5												
220251	50	4	8276.5			.96953639	C1 .101 00			.24221087	02 .102 00			.12019439	06 .185 00
220326	50	4	8276.5												
220351	50	4	8276.5			.97102400	C1 .101 00			.24436529	02 .102 00			.12017558	06 .185 00
220426	50	4	8276.5												
220451	50	4	8276.5			.97250269	C1 .101 00			.24652137	02 .102 00			.12015690	06 .185 00
220526	50	4	8276.5												
220551	50	4	8276.5			.97397247	C1 .101 00			.24867918	02 .103 00			.12013834	06 .185 00
220626	50	4	8276.5												
220651	50	4	8276.5			.97543359	C1 .101 00			.25083861	02 .103 00			.12011991	06 .185 00
220726	50	4	8276.5												
220751	50	4	8276.5			.97688596	C1 .101 00			.25299968	02 .103 00			.12010159	06 .185 00

TIME	STATION		NUMBER	4	62/10/18		ITERATION	NUMBER	3	PASS	NUMBER	10/181	PAGE	7				
	TC	Q			FRQ	DEC									HA	CC3		
220826	50	4	8276.5															
220851	50	4	8276.5	.97832968	C1	.101	00	-.0139*	.25516242	02	.103	00	-.0977*	.12008340	06	.185	00	.0029
220926	50	4	8276.5	.97976498	C1	.101	00	-.0201*	.25732672	02	.103	00	-.1140*	.12006532	06	.185	00	.0000
220951	50	4	8276.5	.98119164	C1	.101	00	-.0183*	.25949266	02	.103	00	-.1729*	.12004736	06	.185	00	-.0020
221026	50	4	8276.5	.98261005	C1	.101	00	.0117*	.26166011	02	.103	00	-.1616*	.12002952	06	.185	00	-.0176
221126	50	4	8276.5	.98402005	C1	.101	00	-.0282*	.26382921	02	.103	00	-.1387*	.12001179	06	.185	00	.0303
221151	50	4	8276.5	.98542184	C1	.101	00	-.0002*	.26599978	02	.103	00	-.3223*	.11999417	06	.185	00	-.0156
221226	50	4	8276.5	.98681527	C1	.101	00	-.0158*	.26817184	02	.103	00	-.1294*	.11997667	06	.185	00	.0264
221251	50	4	8276.5	.98820083	C1	.101	00	-.0155*	.27034542	02	.103	00	-.1167*	.11995928	06	.185	00	-.0215
221326	50	4	8276.5	.98957815	C1	.101	00	-.0131*	.27252048	02	.103	00	-.1382*	.11994200	06	.185	00	.0000
221351	50	4	8276.5	.99094748	C1	.101	00	-.0206*	.27469701	02	.103	00	-.0981*	.11992483	06	.185	00	-.0088
221426	50	4	8276.5	.99230876	C1	.101	00	-.0101*	.27687499	02	.103	00	-.1519*	.11990776	06	.185	00	-.0439
221451	50	4	8276.5	.99366239	C1	.101	00	-.0234*	.27905440	02	.103	00	-.1523*	.11989081	06	.185	00	.0527
221526	50	4	8276.5	.99500811	C1	.101	00	-.0128*	.28123518	02	.103	00	-.1943*	.11987395	06	.185	00	-.0146
221551	50	4	8276.5	.99676731	C1	.101	00	-.0231*	.28560100	02	.103	00	-.1733*	.11984056	06	.185	00	-.0010
221626	50	4	8276.5	.99899885	C1	.101	00	.0219*	.28778598	02	.103	00	-.1577*	.11982402	06	.185	00	.0225
221651	50	4	8276.5	.10003139	C2	.101	00	-.0231*	.28997230	02	.103	00	-.1548*	.11980757	06	.185	00	.0244
221726	50	4	8276.5	.10016215	C2	.101	00	-.0240*	.29215996	02	.103	00	-.2212*	.11979123	06	.185	00	-.0127
221751	50	4	8276.5	.10029216	C2	.101	00	-.0048*	.29434894	02	.103	00	-.1606*	.11977499	06	.185	00	-.0098
221826	50	4	8276.5	.10042143	C2	.101	00	-.0175*	.29653923	02	.103	00	-.0776*	.11975884	06	.185	00	.0166
221851	50	4	8276.5	.10054996	C2	.101	00	-.0302*	.29873082	02	.103	00	-.1089*	.11974279	06	.185	00	.0059
221926	50	4	8276.5	.10067776	C2	.101	00	-.0147*	.30092368	02	.103	00	-.1204*	.11972684	06	.185	00	-.0010
221951	50	4	8276.5	.10080485	C2	.101	00	-.0233*	.30311781	02	.103	00	-.1218*	.11971098	06	.185	00	-.0225
222026	50	4	8276.5	.10093123	C2	.101	00	-.0217*	.30531318	02	.103	00	-.1116*	.11969522	06	.185	00	-.0176
222051	50	4	8276.5	.10105688	C2	.101	00	-.0181*	.30750977	02	.103	00	-.1255*	.11967954	06	.185	00	-.0049
222076	50	4	8276.5	.10118183	C2	.101	00	-.0304*	.30970760	02	.103	00	-.1152*	.11966396	06	.185	00	.0566
222126	50	4	8276.5	.10130608	C2	.101	00	-.0128*	.31190664	02	.103	00	-.2910*	.11964847	06	.185	00	.0273
222151	50	4	8276.5	.10142963	C2	.101	00	-.0168*	.31410687	02	.103	00	-.2114*	.11963307	06	.185	00	-.0117

CC3

TIME	STATION	TC	Q	NUMBER	4	02/10/18	ITERATION	NUMBER	3	PASS	NUMBER	10/181	PAGE	8
				FRQ		DEC			HA			CC3		
223626	50	4	8276.5	.10155250	02	.101 00	-.0269*	.31630828	02	.103 00	-.1255*	.11961776	06	.185 00
223651	50	4	8276.5	.10167468	02	.101 00	-.0130*	.31851087	02	.103 00	-.2656*	.11960253	06	.185 00
223726	50	4	8276.5	.10179617	02	.101 00	-.0189*	.32071460	02	.103 00	-.1943*	.11958740	06	.185 00
223751	50	4	8276.5	.10191699	02	.101 00	-.0168*	.32291947	02	.103 00	-.2451*	.11957234	06	.185 00
223826	50	4	8276.5	.10203716	02	.101 00	-.0167*	.32512546	02	.103 00	-.2480*	.11955738	06	.185 00
223851	50	4	8276.5	.10215664	02	.101 00	-.0105*	.32733259	02	.103 00	-.3047*	.11954249	06	.185 00
223926	50	4	8276.5	.10227546	02	.101 00	-.0162*	.32954082	02	.103 00	-.2813*	.11952769	06	.185 00
223951	50	4	8276.5	.10239365	02	.102 00	-.0158*	.33175014	02	.103 00	-.2988*	.11951297	06	.185 00
224026	50	4	8276.5	.10262805	02	.102 00	.2998*	.33617196	02	.103 00	-2.3516*	.11949833	06	.185 00
224051	50	4	8276.5	.10535323	02	.102 00	-.0740*	.39177232	02	.103 00	-.1323*	.11948378	06	.186 00
224126	50	4	8276.5	.10545485	02	.102 00	-.0840*	.39400768	02	.103 00	-.1758*	.11914345	06	.186 00
224151	50	4	8276.5	.10555595	02	.102 00	-.0938*	.39624380	02	.103 00	-.1938*	.11913068	06	.186 00
224226	50	4	8276.5	.10605348	02	.102 00	-.0224*	.40743598	02	.103 00	-.1934*	.11911798	06	.186 00
224326	50	4	8276.5	.10624890	02	.102 00	-.0175*	.41191803	02	.103 00	-.2358*	.11905532	06	.186 00
224351	50	4	8276.5	.10634584	02	.102 00	-.0269*	.41416014	02	.104 00	-.1104*	.11903065	06	.186 00
224426	50	4	8276.5	.10644227	02	.102 00	-.0363*	.41640296	02	.104 00	-.0469*	.11901839	06	.186 00
224451	50	4	8276.5	.10653822	02	.102 00	-.0296*	.41864648	02	.104 00	-.0874*	.11900619	06	.186 00
224526	50	4	8276.5	.10663367	02	.102 00	-.0330*	.42089069	02	.104 00	-.1499*	.11899403	06	.186 00
224551	50	4	8276.5	.10672861	02	.102 00	-.0242*	.42313558	02	.104 00	-.1606*	.11898193	06	.186 00
224626	50	4	8276.5	.10682308	02	.102 00	-.0294*	.42538113	02	.104 00	-.0811*	.11896988	06	.186 00
224651	50	4	8276.5	.10691705	02	.102 00	-.0345*	.42762737	02	.104 00	-.0640*	.11895788	06	.186 00
224726	50	4	8276.5	.10701054	02	.102 00	-.0276*	.42987427	02	.104 00	-.0847*	.11894593	06	.186 00
224751	50	4	8276.5	.10793575	02	.102 00	-.0317*	.45279098	02	.104 00	-.0957*	.11893403	06	.186 00
224826	50	4	8276.5	.10802403	02	.102 00	-.0283*	.45504475	02	.104 00	-.0991*			
224851	50	4	8276.5	.10811186	02	.102 00	-.0308*	.45729908	02	.104 00	-.0889*			
224926	50	4	8276.5	.10819926	02	.102 00	-.0372*	.45955398	02	.104 00	-.0344*			
224951	50	4	8276.5	.10828620	02	.102 00	-.0197*	.46180944	02	.104 00	-.0859*			
225026	50	4	8276.5	.10837271	02	.102 00	-.0261*	.46406544	02	.104 00	-.0737*			
225051	50	4	8276.5	.10845878	02	.102 00	-.0344*	.46632198	02	.104 00	-.0735*			
225126	50	4	8276.5	.10854440	02	.102 00	-.0367*	.46857907	02	.104 00	-.0713*			
225151	50	4	8276.5	.10862961	02	.102 00	-.0331*	.47083668	02	.104 00	-.0833*			

CC3

10/181

PASS NUMBER

3

HA

ITERATION

62/10/18

4

FRQ

STATION NUMBER

TC Q

DEC

TIME

234702	0	0	.0	.10871438	02	.102	00	-.0332*	.47309482	02	.104	00	-.0913*
234802	0	0	.0	.10875873	02	.102	00	-.0394*	.47535348	02	.104	00	-.0833*
234902	0	0	.0	.10888264	02	.102	00	-.0195*	.47761263	02	.104	00	-.0713*
235002	0	0	.0	.10896614	02	.103	00	-.0276*	.47987229	02	.104	00	-.0994*
235102	0	0	.0	.10904922	02	.103	00	-.0178*	.48213245	02	.104	00	-.1294*
235202	0	0	.0	.10913187	02	.103	00	-.0278*	.48439310	02	.104	00	-.1377*
235302	0	0	.0	.10921411	02	.103	00	-.0356*	.48665425	02	.104	00	-.1060*
235402	0	0	.0	.10929593	02	.103	00	-.0436*	.48891587	02	.104	00	-.0962*
235502	0	0	.0	.10937734	02	.103	00	-.0025*	.49117795	02	.104	00	-.1006*
235602	0	0	.0	.10945836	02	.103	00	-.0393*	.49344051	02	.104	00	-.1230*
235702	0	0	.0	.10953896	02	.103	00	-.0172*	.49570349	02	.104	00	-.1455*
235802	0	0	.0	.10961915	02	.103	00	-.0249*	.49796696	02	.104	00	-.1641*
235902	0	0	.0	.10969894	02	.103	00	-.0326*	.50023087	02	.104	00	-.1445*

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000002	0	0	.0	.10977833	02	.103	00	-.0202*	.50249561	02	.104	00	-.0791*
000102	0	0	.0	.10985732	02	.103	00	-.0298*	.50476039	02	.104	00	-.0776*
000202	0	0	.0	.10993593	02	.103	00	-.0294*	.50702560	02	.104	00	-.1023*
000302	0	0	.0	.11001413	02	.103	00	-.0350*	.50929124	02	.104	00	-.0950*
000402	0	0	.0	.11009194	02	.103	00	-.0425*	.51155727	02	.104	00	-.0876*
000502	0	0	.0	.11024639	02	.103	00	-.0314*	.51609060	02	.104	00	-.0952*
000602	0	0	.0	.11032304	02	.103	00	-.0348*	.51835786	02	.105	00	-.0862*
000702	0	0	.0	.11039929	02	.103	00	-.0341*	.52062553	02	.105	00	-.0930*
000802	0	0	.0	.11047519	02	.103	00	-.0414*	.52289358	02	.105	00	-.0881*
000902	0	0	.0	.11055069	02	.103	00	-.0287*	.52516200	02	.105	00	-.0730*
001002	0	0	.0	.11062579	02	.103	00	-.0359*	.52743080	02	.105	00	-.0940*
001102	0	0	.0	.11070054	02	.103	00	-.0331*	.52969997	02	.105	00	-.1030*
001202	0	0	.0	.11077491	02	.103	00	-.0283*	.53196950	02	.105	00	-.0923*
001302	0	0	.0	.11084889	02	.103	00	-.0354*	.53423940	02	.105	00	-.1013*
001402	0	0	.0	.11092251	02	.103	00	-.0305*	.53650966	02	.105	00	-.1104*
001502	0	0	.0	.11099576	02	.103	00	-.0195*	.53878025	02	.105	00	-.1177*
001602	0	0	.0	.11106864	02	.103	00	-.0266*	.54105119	02	.105	00	-.1050*
001702	0	0	.0	.11114116	02	.104	00	-.0334*	.54332245	02	.105	00	-.0842*
001802	0	0	.0	.11121329	02	.104	00	-.0104*	.54559404	02	.105	00	-.0874*
001902	0	0	.0	.11128507	02	.104	00	-.0173*	.54786599	02	.105	00	-.0947*
002002	0	0	.0	.11135648	02	.104	00	-.0321*	.55013823	02	.105	00	-.1082*
002102	0	0	.0	.11142753	02	.104	00	-.0389*	.55241080	02	.105	00	-.1074*
002202	0	0	.0	.11149822	02	.104	00	-.0058*	.55468363	02	.105	00	-.1169*
002302	0	0	.0	.11156855	02	.104	00	-.0125*	.55695680	02	.105	00	-.1045*

MARINER STATISTICS

STATION 4

ITERATION 3

PASS	DATA TYPE	BEGINNING TIME	END TIME	NUMBER OF POINTS	STD DEV	RMS	FIRST MOMENT	SECOND MOMENT
10/181	CC3	10/18-183926	10/18-232726	213	.218-01	.218-01	.481-03	.477-03

STATION		NUMBER	5	62/10/18	ITERATION	NUMBER	3	PASS	NUMBER	10/182	PAGE	10
TIME	TC	C	FRQ	DEC			HA					CC3
233926	50	5	8379.6	.10221262 02 .183 00	.0458	.29029433 03 .188 00			.0100	.11501267 06 .187 00		-.0107
233951	50	5	8379.6	.10236224 02 .183 00	.0267	.29052548 03 .188 00			.0087	.11499732 06 .187 00		-.0625
234026	50	5	8379.6	.10251124 02 .183 00	.0076	.29075679 03 .188 00			.0052	.11498208 06 .187 00		.0166
234126	50	5	8379.6	.10265962 02 .183 00	.0206	.29098826 03 .188 00			.0036	.11496695 06 .187 00		-.0117
234226	50	5	8379.6	.10280737 02 .183 00	.0056	.29121988 03 .188 00			-.0021	.11495193 06 .187 00		-.0674
234251	50	5	8379.6	.10295451 02 .183 00	.0167	.29145164 03 .188 00			.0040	.11493701 06 .187 00		.0107
234326	50	5	8379.6	.10310105 02 .183 00	.0258	.29168355 03 .187 00			.0080	.11492220 06 .187 00		.1221
234351	50	5	8379.6	.10324699 02 .183 00	.0110	.29191560 03 .187 00			.0017	.11490749 06 .187 00		-.0518
234426	50	5	8379.6	.10339235 02 .183 00	.0163	.29214780 03 .187 00			.0054	.11489289 06 .187 00		-.0313
234526	50	5	8379.6	.10368131 02 .183 00	.0091	.29261263 03 .187 00			.0023	.11486400 06 .187 00		-.0029
234551	50	5	8379.6	.10382493 02 .183 00	.0325	.29284525 03 .186 00			.0096	.11484971 06 .187 00		-.0361
234626	50	5	8379.6	.10396797 02 .183 00	.0180	.29307801 03 .186 00			.0067	.11483553 06 .187 00		-.0313
234651	50	5	8379.6	.10411045 02 .183 00	.0036	.29331091 03 .186 00			.0096	.11482145 06 .187 00		.0283
234726	50	5	8379.6	.10425238 02 .183 00	.0251	.29354395 03 .186 00			.0125	.11480747 06 .187 00		.0264
234751	50	5	8379.6	.10439374 02 .183 00	.0108	.29377712 03 .186 00			.0151	.11479360 06 .187 00		.0010
234826	50	5	8379.6	.10453457 02 .183 00	-.0034	.29401042 03 .186 00			.0137	.11477982 06 .187 00		-.0254
234851	50	5	8379.6	.10467486 02 .183 00	.0203	.29424385 03 .185 00			.0161	.11476615 06 .187 00		.0264
234926	50	5	8379.6	.10481460 02 .183 00	.0062	.29447742 03 .185 00			.0184	.11475258 06 .187 00		.0156
234951	50	5	8379.6	.10495382 02 .183 00	.0161	.29471112 03 .185 00			.0146	.11473911 06 .187 00		-.0547
235026	50	5	8379.6	.10509248 02 .183 00	.0020	.29494494 03 .185 00			.0146	.11472574 06 .187 00		-.0059
235051	50	5	8379.6									
235126	50	5	8379.6									
235151	50	5	8379.6									
235226	50	5	8379.6									
235251	50	5	8379.6									
235326	50	5	8379.6									
235351	50	5	8379.6									
235426	50	5	8379.6									
235451	50	5	8379.6									
235526	50	5	8379.6									
235551	50	5	8379.6									
235626	50	5	8379.6									
235651	50	5	8379.6									
235726	50	5	8379.6									
235751	50	5	8379.6									
235826	50	5	8379.6									
235851	50	5	8379.6									
235926	50	5	8379.6									
235951	50	5	8379.6									
62/10/19												
000026	50	5	8379.6	.10510894 02 .183 00	.0242	.29519925 03 .188 00			-.0058	.11471248 06 .187 00		.0225
000051	50	5	8379.6	.10524477 02 .183 00	.0104	.29543355 03 .188 00			-.0063	.11469931 06 .187 00		-.0088
000126	50	5	8379.6	.10538009 02 .183 00	.0327	.29566799 03 .188 00			-.0069	.11468624 06 .187 00		-.0186
000151	50	5	8379.6	.10551489 02 .183 00	.0190	.29590254 03 .188 00			-.0036	.11467327 06 .187 00		.0117
000226	50	5	8379.6	.10564921 02 .183 00	.0054	.29613721 03 .188 00			-.0064	.11466039 06 .187 00		.0049
000251	50	5	8379.6							.11464762 06 .187 00		.0195
000326	50	5	8379.6									
000351	50	5	8379.6									
000426	50	5	8379.6									
000451	50	5	8379.6									
000526	50	5	8379.6									

TIME	TC	Q	STATION	NUMBER	5	62/10/19	ITERATION	NUMBER	3	PASS	NUMBER	10/182	PAGE	11	
				FRQ		DEC			HA				CC3		
000551	50	5	8379.6		.10578303	02 .183 00	.0159	.29637200	03 .188 00	-	.0033	.11463494	06 .187 00	-	.0049
000626	50	5	8379.6		.10591635	02 .183 00	.0404	.29660691	03 .187 00	-	.0043	.11462236	06 .187 00		.0146
000651	50	5	8379.6		.10604917	02 .183 00	.0289	.29684193	03 .187 00	-	.0075	.11460988	06 .187 00	-	.0234
000726	50	5	8379.6		.10618151	02 .183 00	.0135	.29707708	03 .187 00	-	.0088	.11459750	06 .187 00		.0029
000826	50	5	8379.6		.10631337	02 .183 00	.0161	.29731233	03 .187 00	-	.0062	.11458521	06 .187 00	-	.0283
000851	50	5	8379.6		.10644474	02 .183 00	.0228	.29754771	03 .187 00	-	.0097	.11457301	06 .187 00	-	.0146
000926	50	5	8379.6		.10657564	02 .183 00	.0096	.29778318	03 .187 00	-	.0114	.11456092	06 .187 00	-	.0176
000951	50	5	8379.6		.10670608	02 .183 00	.0183	.29801878	03 .187 00	-	.0111	.11454891	06 .187 00	-	.0146
001026	50	5	8379.6		.10683603	02 .183 00	.0231	.29825448	03 .187 00	-	.0109	.11453701	06 .187 00		.0322
001126	50	5	8379.6		.10696552	02 .183 00	.0100	.29849030	03 .187 00	-	.0109	.11452519	06 .187 00	-	.0137
001151	50	5	8379.6		.10709454	02 .183 00	.0289	.29872622	03 .187 00	-	.0089	.11451347	06 .187 00	-	.0146
001226	50	5	8379.6		.10722311	02 .183 00	.0159	.29896225	03 .186 00	-	.0131	.11450185	06 .187 00	-	.0088
001251	50	5	8379.6		.10735122	02 .183 00	.0189	.29919839	03 .186 00	-	.0094	.11449032	06 .187 00		.0234
001326	50	5	8379.6		.10747886	02 .183 00	.0259	.29943463	03 .186 00	-	.0118	.11446753	06 .187 00	-	.0098
001426	50	5	8379.6		.10773280	02 .183 00	.0242	.29990745	03 .186 00	-	.0069	.11445628	06 .187 00		.0244
001451	50	5	8379.6		.10785909	02 .183 00	.0114	.30014401	03 .186 00	-	.0076	.11444511	06 .187 00	-	.0332
001526	50	5	8379.6		.10798493	02 .183 00	.0387	.30038067	03 .186 00	-	.0084	.11443404	06 .188 00	-	.0410
001551	50	5	8379.6		.10811036	02 .183 00	.0220	.30061744	03 .186 00	-	.0073	.11442306	06 .188 00		.0576
001626	50	5	8379.6		.10823531	02 .183 00	.0153	.30085431	03 .186 00	-	.0063	.11441217	06 .188 00	-	.0068
001651	50	5	8379.6		.10835984	02 .183 00	.0247	.30109128	03 .186 00	-	.0055	.11440137	06 .188 00	-	.0146
001726	50	5	8379.6		.10848393	02 .183 00	.0321	.30132835	03 .186 00	-	.0047	.11439067	06 .188 00	-	.0264
001751	50	5	8379.6		.10860759	02 .183 00	.0195	.30156552	03 .186 00	-	.0060	.11438005	06 .188 00		.0127
001826	50	5	8379.6		.10873082	02 .183 00	.0311	.30180280	03 .186 00	-	.0094	.11436952	06 .188 00		.0010
001851	50	5	8379.6		.10885361	02 .183 00	.0186	.30204016	03 .186 00	-	.0109	.11435908	06 .188 00		.0615
001926	50	5	8379.6		.10897599	02 .183 00	.0361	.30227762	03 .186 00	-	.0065	.11434873	06 .188 00		.0127
001951	50	5	8379.6		.10909795	02 .183 00	.0238	.30251519	03 .185 00	-	.0062	.11433846	06 .188 00	-	.0244
003226	50	5	8379.6		.10921946	02 .183 00	.0135	.30275284	03 .185 00	-	.0041	.11432829	06 .188 00		.0303
003251	50	5	8379.6												
003326	50	5	8379.6												

TIME	STATION		5	62/10/19		ITERATION	NUMBER	3	PASS	NUMBER	10/182	PAGE		12
	TC	Q		FRQ	DEC							HA	CC3	
003351	50	5	8379.6	.1C934056	02 .183 00	.0272	.30299060	03 .185 00	- .0060		.11431820	06 .188 00	.0371	
003426	50	5	8379.6	.1C946126	02 .183 00	.0150	.30322845	03 .185 00	- .0080		.11430820	06 .188 00	.0166	
003451	50	5	8379.6	.10958152	02 .183 00	.0508	.30346640	03 .185 00	- .0080		.11429829	06 .188 00	.0293	
003526	50	5	8379.6	.10970138	02 .183 00	.0167	.30370444	03 .185 00	- .0062		.11428846	06 .188 00	.0146	
003551	50	5	8379.6	.1C982082	02 .183 00	.0266	.30394257	03 .185 00	- .0105		.11427872	06 .188 00	-.0264	
003626	50	5	8379.6	.10993984	02 .183 00	.0145	.30418079	03 .185 00	- .0069		.11426907	06 .188 00	-.0117	
003651	50	5	8379.6	.11005847	02 .183 00	.0265	.30441911	03 .185 00	- .0053		.11425950	06 .188 00	.0156	
003726	50	5	8379.6	.11017669	02 .183 00	.0145	.30465751	03 .185 00	- .0139		.11425002	06 .188 00	.0576	
003751	50	5	8379.6	.11029450	02 .183 00	.0405	.30489600	03 .185 00	- .0125		.11424062	06 .188 00	-.0049	
003826	50	5	8379.6	.11041191	02 .183 00	.0286	.30513459	03 .185 00	- .0092		.11423131	06 .188 00	.0078	
003851	50	5	8379.6	.11052892	02 .183 00	.0308	.30537327	03 .185 00	- .0101		.11422208	06 .188 00	.0156	
003926	50	5	8379.6	.11064552	02 .183 00	.0190	.30561203	03 .185 00	- .0090		.11421294	06 .188 00	.0605	
004026	50	5	8379.6	.11076174	02 .183 00	.0251	.30585088	03 .185 00	- .0080		.11420388	06 .188 00	-.0400	
004051	50	5	8379.6	.11087755	02 .183 00	.0134	.30608982	03 .185 00	- .0091		.11419490	06 .188 00	.0176	
004126	50	5	8379.6	.11099297	02 .183 00	.0297	.30632885	03 .185 00	- .0082		.11418601	06 .188 00	.0117	
004151	50	5	8379.6	.11110800	02 .183 00	.0181	.30656796	03 .185 00	- .0095		.11417720	06 .188 00	.0635	
004226	50	5	8379.6	.11122262	02 .183 00	.0065	.30680716	03 .185 00	- .0109		.11416847	06 .188 00	.0313	
004251	50	5	8379.6	.11133687	02 .183 00	.0328	.30704644	03 .185 00	- .0063		.11415982	06 .188 00	-.0020	
004326	50	5	8379.6	.11145074	02 .183 00	- .0007	.30728581	03 .185 00	- .0098		.11415126	06 .188 00	.0039	
004351	50	5	8379.6	.11156422	02 .183 00	.0258	.30752526	03 .185 00	- .0074		.11414277	06 .188 00	-.0137	
004426	50	5	8379.6	.11167730	02 .183 00	.0144	.30776480	03 .185 00	- .0071		.11413437	06 .188 00	-.1113	
004451	50	5	8379.6	.11179000	02 .183 00	.0229	.30800442	03 .184 00	- .0069		.11412605	06 .188 00	-.0098	
004526	50	5	8379.6	.11190233	02 .183 00	.0116	.30824412	03 .184 00	- .0067		.11411781	06 .188 00	-.0078	
004551	50	5	8379.6	.11201428	02 .183 00	.0282	.30848389	03 .184 00	- .0046		.11410965	06 .188 00	.0127	
004626	50	5	8379.6	.11212583	02 .183 00	.0169	.30872376	03 .184 00	- .0047		.11410157	06 .188 00	-.0273	
004651	50	5	8379.6	.11223702	02 .183 00	.0256	.30896370	03 .184 00	- .0027		.11409356	06 .188 00	-.0254	
004726	50	5	8379.6	.11234783	02 .183 00	.0144	.30920373	03 .184 00	- .0029		.11408564	06 .188 00	-.0215	

TIME	TC	Q	FRQ	STATION NUMBER	5	62/10/19	ITERATION	NUMBER	3	PASS	NUMBER	10/182	PAGE	13
						DEC			HA					CC3
010051	50	5	8379.6			.11245827 02 .183 00	.0392	.30944383 03 .184 00		.0008				
010126	50	5	8379.6			.11256833 02 .183 00	.0021	.30968401 03 .184 00		-.0035		.11407780 06 .188 00		-.0186
010151	50	5	8379.6											

MARINER STATISTICS

PASS	DATA TYPE	BEGINNING TIME	END TIME	NUMBER OF POINTS	STD DEV	RMS	FIRST MOMENT	SECOND MOMENT
10/182	CC3	10/18-233926	10/19-010126	81	.331-01	.331-01	-.591-03	.109-02
	HA	10/18-183951	10/19-010151	81	.795-02	.868-02	-.348-02	.753-04
	DEC	10/18-183951	10/19-010151	81	.106-01	.229-01	.203-01	.525-03

ITERATION 3 GENERATED 16 PLOTS.

OFFLINE CONTROL
KEY(5)
END DATA

(27
(00

3

ITERATION NUMBER

INPUT COVARIANCE MATRIX OF ESTIMATED PARAMETERS

	X	Y	Z	DX	DY	DZ	KE	KM	R104
X	.14764372-01	.12133066-01	.32046576-01	.34204017-04	.18074241-04	.81292810-04	.20391675 00	-.27649536-02	.11288408-02
Y	.12133066-01	.37882355 00	.69408379 00	.62127899-03	.40216185-03	.88521368-03	.15001394 01	-.39016967-01	-.11485511-02
Z	.32046576-01	.69408379 00	.14102823 01	.13862572-02	.80493197-03	.20125665-02	.27768874 01	-.74956287-01	.31840237-02
DX	.34204017-04	.62127899-03	.13862572-02	.14821648-05	.77838174-06	.21499007-05	.26652212-02	-.67547600-04	.77406520-05
DY	.18074241-04	.40216185-03	.80493197-03	.77838174-06	.46367414-06	.11422535-05	.15577744-02	-.41946636-04	.14039659-05
DZ	.81292810-04	.88521368-03	.20125665-02	.21499007-05	.11422535-05	.32694424-05	.36012987-02	-.10523597-03	.14375357-04
KE	.20391675 00	.15001394 01	.27768874 01	.26652212-02	.15577744-02	.36012987-02	.14693488 02	.43016005-01	.20345894-02
KM	-.27649536-02	.39016967-01	.74956287-01	.67547600-04	.41946636-04	.10523597-03	.43016005-01	.24997383 02	-.37514658-04
R104	.11288408-02	-.11485511-02	.31840237-02	.77406520-05	.14039659-05	.14375357-04	.20345894-02	-.37514658-04	.35888258-02
LA04	.64921410-05	-.95787267-04	-.10712261-03	-.45808345-07	-.49489806-07	.71638385-08	.11604473-03	-.18836405-05	-.38697642-06
LA05	.17821332-04	.20711727-03	.4402967-03	.38797852-06	.27904520-06	.74407486-06	.15673334-03	.96496817-05	-.94684862-09
R105	.14240673-02	.46162228-02	.13476359-01	.15716320-04	.76274993-05	.28133621-04	-.34446820-02	.52224820-04	.24265958-05
LA05	.24765557-04	.79823242-04	.23336013-03	.27221903-06	.13211916-06	.48779286-06	-.60260862-04	.78062734-06	.55369127-07
LA05	-.22069476-04	-.68286459-04	-.25443635-03	-.30110982-06	-.14157366-06	-.51455739-06	.54655159-04	-.79384651-05	.21584615-06

	LA04	LA05	R105	LA05	LA05
X	.64921410-05	.17821332-04	.14240673-02	.24765557-04	-.22069476-04
Y	-.95787267-04	.20711727-03	.46162228-02	.79823242-04	-.88286459-04
Z	-.10712261-03	.4402967-03	.13476359-01	.23336013-03	-.25443635-03
DX	-.45808345-07	.38797852-06	.15716320-04	.27221903-06	-.30110982-06
DY	-.49489808-07	.27904520-06	.76274993-05	.13211916-06	-.14157366-06
DZ	.71638385-08	.74407486-06	.28133621-04	.48779286-06	-.51455739-06
KE	.11604473-03	-.15673334-03	-.34468520-02	-.60260862-04	.54655159-04
KM	-.18836405-05	.96496817-05	.52224820-04	.78062734-06	-.79384651-05
R104	-.38697642-06	-.94684862-09	.24265958-05	.55369127-07	.21584615-06
LA04	.98208596-06	.31229541-08	.35150149-06	.65444070-08	.10230792-07
LA05	.31229541-08	.95988285-06	-.30097933-06	-.45436834-08	.35015982-07
R105	.35150149-06	-.30097933-06	.35805436-02	-.33679265-06	-.96466709-07
LA05	.65444070-08	-.45436834-08	-.33679265-06	.99413668-06	-.25765525-08
LA05	.10230792-07	.35015982-07	-.96466709-07	-.25765525-08	.95812277-06

3

INPUT J MATRIX OF ESTIMATED PARAMETERS

ITERATION NUMBER

	X	Y	Z	DX	DY	DZ	KE	KM	RI04
X	.54118917 02	-.72830780 02	.88354531 02	-.29061026 05	-.14223054 05	-.12823207 05	.00000000 00	.00000000 00	.00000000 00
Y	-.72830780 02	.26038586 03	-.25506021 03	.55915933 05	-.67048375 04	.53621163 05	.00000000 00	.00000000 00	.00000000 00
Z	.88354531 02	-.25506021 03	.25803798 03	.61470469 05	-.15768433 04	-.51339392 05	.00000000 00	.00000000 00	.00000000 00
DX	-.29061026 05	.55915933 05	-.61470469 05	.17347512 08	.49997007 07	.10624060 08	.00000000 00	.00000000 00	.00000000 00
DY	-.14223054 05	-.67048375 04	-.15768433 04	.49997007 07	.79223018 07	-.24343293 07	.00000000 00	.00000000 00	.00000000 00
DZ	-.12823207 05	.53621163 05	-.51339392 05	.10624060 08	-.24343293 07	.11169038 08	.00000000 00	.00000000 00	.00000000 00
KE	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.62500000-01	.00000000 00	.00000000 00
KM	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.39999999-01	.00000000 00
RI04	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.27777777 03
LA04	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00
RI05	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00
LA05	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00
L005	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00

L005

LA05

RI05

L004

LA04

X	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00
Y	-.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00
Z	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00
DX	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00
DY	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00
DZ	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00
KE	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00
KM	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00
RI04	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00
LA04	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00
L004	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00
RI05	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00
LA05	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00
L005	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00

CASE 1

SPACE TRAJECTORIES

1

EPHEMERIDES WITH VENUS VELOCITIES

GME	.39860005	06	J	.16234500-02	H	-.57499999-05	D	.78749999-05	RE	.63781650	04	REM	.63783149	04
G	.66709928-19		A	.88745998	29	B	.88763998	29	C	.88800998	29	OME	.41780741-02	09
GMM	.49007604	04	GMS	.13271544	12	GMV	.32476952	06	GMA	.42977799	05	GMB	.37918700	08
ARA	.27890000	01	GB	.00000000	00	MAS	.34020000	03	GB1	.00000000	00	GB2	.00000000	00
												SC	.00000000	00

INJECTION CONDITIONS

JULIAN DATE 2437956.23429397

OCT. 18, 1962 17 37 23.000

GEOCENTRIC

XO	.58072046	04	YO	-.18712696	04	ZO	-.28917849	04	DXO	.36254794	01	DYO	.97646336	01	DZO	-.28587352	01
GMC	.00000000	00	SGC	.00000000	00	TO	.63443000	05	GHA	.29107121	03	GHO	.26001651	02			

O DAYS 0 HRS. 0 MIN. 0.000 SEC.

JULIAN DATE 2437956.23429397

OCT. 18, 1962 17 37 23.000

GEOCENTRIC

X	.58072044	04	Y	-.18712696	04	Z	-.28917849	04	DX	.36254793	01	DY	.97646332	01	DZ	-.28587351	01
R	.67518658	04	DEC	-.25359354	02	RA	.34213937	03	V	.10801135	02	PTH	.87138015	01	AZ	.10292466	03
R	.67518657	04	LAT	-.25359354	02	LON	.51068163	02	VE	.10373187	02	PTE	.90762677	01	AZE	.10348129	03
XS	-.13520355	09	YS	-.57485767	08	ZS	-.24927463	08	DXS	.12999477	02	DYS	-.24699600	02	DZS	-.10709378	02
XM	-.35387369	05	YM	.35420195	06	ZM	.13533407	06	DXM	-.10263042	01	DYM	-.47486982	-01	DZM	.61074528	-01
XT	-.35387369	05	YT	.35420195	06	ZT	.13533407	06	DXT	-.10263042	01	DYT	-.47486982	-01	DZT	.61074528	-01
RS	.14901675	09	VS	.29895608	02	RM	.38082357	06	VM	.10292159	01	RT	.38082357	06	VT	.10292159	01
GED	-.25510281	02	ALT	.37762042	03	LOS	.27196299	03	RAS	.20303420	03	RAM	.95705333	02	LOM	.16463412	03
DUT	.49007604	04	DT	.37500000	01	DR	.16363603	01	SHA	.53923427	04	DES	-.96296881	01	DEM	.20816250	02

EQUATORIAL COORDINATES

GEOCENTRIC

SMA	.28338733	06	ECC	.97672778	00	INC	.28267556	02	LAN	.10032215	03	APF	.22709996	03	RCA	.65950506	04
VH	.12868380	00	C3	-.14065556	01	C1	.72086041	05	SLR	.13036620	05	APD	.56017961	06	TFP	.18867777	03
TA	.17636897	02	EA	.19287476	01	MA	.45241957	-01	DAD	-.20299315	02	RAO	.32378684	03	MTA	.18000000	03
WX	.46592490	00	WY	.84859043	-01	WZ	.88074566	00	PX	.75671527	00	PY	-.55409865	00	PZ	-.34692445	00
QX	.45858031	00	QY	.82811443	00	QZ	-.32238249	00	RX	-.74403170	-01	RY	.45422298	00	RZ	-.88777512	00
SXO	.75671527	00	SYO	-.55409865	00	SZO	-.34692445	00	TX	-.64949612	00	TY	-.69760743	00	TZ	-.30248748	00
BX	-.45858034	00	BY	-.82811448	00	BZ	.32238252	00	MX	.20775272	00	MY	.95707242	00	MZ	-.20211671	00
B.T	.47289870	03	B.R	-.38184830	05	B	.60781685	05	PER	.25022493	05	QMD	.11568728	-01	NOD	-.70792969	-02

EQUATORIAL COORDINATES

HELIOCENTRIC

X	.13520936	09	Y	.62654867	08	Z	-.16775000	04	DX	-.93739972	01	DY	.34742733	02	DZ	-.65083369	01
R	.14902081	09	LAT	-.64496807	-03	LON	.24862606	02	V	.36568945	02	PTH	.96058455	01	AZ	.10039908	03
XE	.13520355	09	YE	.62657735	08	ZE	.23125000	03	DXE	-.12999477	02	DYE	.26921386	02	DZE	-.88334083	-03
XT	.13516816	09	YT	.63036539	08	ZT	-.16518000	05	DXT	-.14025781	02	DYT	.26902116	02	DZT	.74041843	-01
LTE	.88913821	-04	LOE	.24864544	02	LTT	-.63456084	-02	LOT	.25002294	02	RST	.14914435	09	VST	.30338949	02
EPS	.52998810	02	ESP	.27453512	-18	SEP	.12699911	03	EPM	.59788076	02	EMP	.87784645	00	MEP	.11933340	03
MPS	.10868797	03	MSP	.13970734	00	SMP	.71172218	02	SEM	.10950789	03	EMS	.70354204	02	ESM	.13776809	00
EPT	.59788076	02	ETP	.87784645	00	TEP	.11933403	03	TPS	.10868797	03	TSP	.13970734	00	STP	.71172218	02
SET	.10950789	03	STE	.70354204	02	EST	.13776809	00	RPM	.38417641	06	RPT	.38417641	06	SPN	-.17845035	02
SAC	.00000000	00															
GCE	.26321723	03	GCT	.28628363	03	SIP	.10842877	03	CPT	.73767243	02	SIN	.73508037	02			
REP	.67518658	04	VEP	.10801135	02												

ECLIPTIC COORDINATES

2

SPACE TRAJECTORIES

CASE 1

HELIOCENTRIC

EPOCH OF PERICENTER PASSAGE		CONIC		ORBITAL B.T. AND B.R.		ECLIPTIC COORDINATES	
SMA	ECC	JULIAN DATE	INC	LAN	APF	SEPT. 26, 1962	10 00 15.031
29899028 09	0.52194708 00	10399080 02	INC	LAN	APF	15175261 03	RCA
11807838 02	0.44387877 03	53731260 10	C1	SLR	APD	45504738 09	TFP
28250957 02	0.16056168 02	77849552 01	MA	DAI	RAI	35700551 03	MTA
75881468 01	0.16377873 00	98357437 00	WZ	PX	PY	52048824 01	PZ
65185274 01	0.98512298 00	15900764 00	QZ	RX	RY	44882075 02	RZ
99498378 00	0.52048824 01	85428537 01	SZ1	TX	TY	99863447 00	TZ
65185279 01	0.8512307 00	15900765 00	BZ	MX	MY	89241447 00	MZ
25176442 09	0.40694425 08	25503207 09	B	PER	DEF		

SELENOCENTRIC

EPOCH OF PERICENTER PASSAGE		CONIC		ORBITAL B.T. AND B.R.		EQUATORIAL COORDINATES	
X	Y	JULIAN DATE	INC	DX	DY	OCT. 21, 1962	07 24 20.223
41194573 05	0.35607322 06	13822585 06	Z	DX	DY	98121201 01	DZ
38417641 06	0.21087782 02	27659928 03	RA	V	PTH	42143218 02	AZ
38417639 06	0.29094274 01	8834020 01	LON	VR	PTR	44322086 02	AZR
15087128 01	0.29766215 03	32355818 01	LNE	80671756 01			
38243841 06	0.36362023 06	74860422 00	ALP	DR	DP	12434584 02	ASD
30700119 03	0.21786003 02	24981456 03	HNG	SIA			
60000000 00							

2 DAYS 13 HRS. 46 MIN. 57.223 SEC.

GEOCENTRIC

EPOCH OF PERICENTER PASSAGE		CONIC		ORBITAL B.T. AND B.R.		EQUATORIAL COORDINATES	
X	Y	JULIAN DATE	INC	DX	DY	OCT. 21, 1962	07 24 20.223
24434589 06	0.24844988 06	10730856 06	Z	DX	DY	50749150 00	DZ
36461950 06	0.17115737 02	13452285 03	RA	V	PTH	79759636 02	AZ
36461949 06	0.17115737 02	35417584 03	LON	VE	PTE	20666052 01	AZE
13217864 09	0.62921468 08	27284285 08	ZS	DXS	DYS	24167957 02	DZS
24468582 06	0.28421080 06	12522617 06	ZM	DXM	DYM	55468048 00	DZM
24468582 06	0.28421080 06	12522617 06	ZT	DXT	DYT	55468048 00	DZT
14891184 09	0.29923666 02	39538402 06	RM	VM	RT	39538402 06	VT
17225496 02	0.35824316 06	65109006 02	LOS	RAS	RAM	13072617 03	LOM
49007604 04	0.48000000 03	91212302 00	DR	SHA	DES	10557630 02	DEM

GEOCENTRIC

EPOCH OF PERICENTER PASSAGE		CONIC		ORBITAL B.T. AND B.R.		EQUATORIAL COORDINATES	
SMA	ECC	JULIAN DATE	INC	LAN	APF	OCT. 18, 1962	19 23 53.352
30031613 06	0.98480658 00	39070658 02	INC	LAN	APF	21586105 03	RCA
10079708 00	0.13272682 01	60082059 05	C1	SLR	APD	59606942 06	TFP
17197484 03	0.10255766 03	47482229 02	MA	DAD	RAO	32153230 03	MTA
58342578 00	0.23846507 00	77636928 00	WZ	PX	PY	57811613 00	PZ
36078291 00	0.78033097 00	51080295 00	QZ	RX	RY	46344991 00	RZ
72763332 00	0.57811613 00	36923090 00	SZ0	TX	TY	67156228 00	TZ
36078284 00	0.78033082 00	51080286 00	BZ	MX	MY	69197949 00	MZ
32391765 05	0.40872208 05	52151356 05	B	PER	OMD	15372429 01	NOD

CASE 1

SPACE TRAJECTORIES

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HELIOCENTRIC

ECLIPTIC COORDINATES

X	.13193429	99	Y	.68853016	08	Z	-.37750000	03	DX	-.14883082	02	DY	.26950781	02	DZ	.12761176	00
R	.14882001	09	LAT	-.14533768	03	LON	.27558862	02	V	.30787449	02	PTH	-.13500039	01	AZ	.89762449	02
XE	.13217864	09	YE	.68582384	08	ZE	.12750000	02	DXE	-.14196225	02	DYE	.26341848	02	DZE	-.10340214	02
XT	.13193395	09	YT	.68892954	08	ZT	.18345000	04	DXT	-.15002753	02	DYT	.25775008	02	DZT	.86008428	01
LTE	.49057291	05	LOE	.27423051	02	LIT	.70619714	03	LDT	.27572553	02	RST	.14883819	09	VST	.29823498	02
EPS	.10451898	03	ESP	.13525975	00	SEP	.75345207	02	EPM	.13830601	03	EMP	.37835540	02	MEP	.38584439	01
MPS	.11702639	03	MSP	.98911702	02	SMP	.62955891	02	SEM	.79190037	02	EMS	.10066046	03	ESM	.14935344	00
EPT	.13830601	03	ETP	.37835540	02	TEP	.38584439	01	TPS	.11702639	03	TSP	.98911702	02	STP	.62955891	02
SET	.79190037	02	STE	.10066046	03	EST	.14935344	00	RPM	.39999999	05	RPT	.39999999	05	SPN	.10351670	03
SAC	.00000000	00	GCT	.28025688	03	SIP	.11453610	03	CPT	.79419438	02	SIN	.76929153	02			
GCE	.10387919	03	VEP	.92688775	00												
REP	.36461950	06															

HELIOCENTRIC

ECLIPTIC COORDINATES

EPOCH OF PERICENTER PASSAGE		JULIAN DATE		ORBITAL B.T. AND B.R.		ECLIPTIC COORDINATES								
SMA	.15880697	09	INC	.23749126	00	LAN	.2437980.06303136							
VH	.27028610	02	CL	.45805166	10	SLR	.27593917	02	APF	.21857915	02	RCA	.13 30 45.910	
TA	-.21892976	02	MA	-.19153268	02	DAI	.88441556	01	APD	.16946919	09	TFP	-.18363857	07
WX	.19204445	02	WZ	.99999141	00	PX	.65008836	00	RAI	.49451659	02	MTA	.18000000	03
QX	-.75985578	00	QZ	.38479611	02	RX	.10278369	02	PY	.75985665	00	PZ	.15435881	02
SXI	.65008836	00	SZI	.15435881	02	TX	.75985775	00	RY	.11520607	02	RZ	-.99999849	00
BX	.75985602	00	BZ	-.38479622	02	MX	-.46265568	00	TY	-.65008938	00	TZ	.32067458	04
B.T.	.15844742	09	B	.15844859	09	PER	.39949352	03	MY	.88652836	00	MZ	.41460189	02

SELENCENTRIC

EQUATORIAL COORDINATES

X	.33993359	03	Y	-.35760926	05	Z	-.17917604	05	DX	.11967172	00	DY	.10621720	01	DZ	.50592982	00
R	.39999999	05	DEC	-.26611602	02	RA	.27054462	03	V	.14825801	01	PTH	-.83602368	02	AZ	.10001899	03
R	.39999999	05	LAT	-.23400902	01	LUN	.32916819	03	VR	.11757296	01	PTR	-.88305484	02	AZR	.13926691	03
LTS	.15301809	01	LNS	.26631341	03	LTE	-.40142985	00	LNE	.69670716	01						
ALT	.38261999	05	SHA	-.35627538	05	ALP	.16189759	01	DR	-.11752156	01	DP	.18874959	03	ASD	.24902844	01
HGE	.25548102	03	SVL	-.32263004	01	HNG	.11707280	03	SIA	.13581572	03						
SAC	.00000000	00															

2 DAYS 22 HRS. 16 MIN. 12.223 SEC.

JULIAN DATE 2437959.16221322

OCT. 21, 1962 15 53 35.223

GEOCENTRIC

EQUATORIAL COORDINATES

X	-.26664170	06	Y	.26776289	06	Z	.12070285	06	DX	-.20208412	01	DY	.99816193	00	DZ	.87750500	00
R	.39669124	06	DEC	.17714493	02	RA	.13487979	03	V	.24187066	01	PTH	.71905386	02	AZ	.75600871	02
R	.39669123	06	LAT	.17714493	02	LON	.22687173	03	VE	.26926945	02	PTE	.48980191	01	AZE	.27039896	03
XS	-.13174237	09	YS	-.63658770	08	ZS	-.27603965	08	DXS	.14358929	02	DYS	-.24090877	02	DZS	-.10445269	02
XM	-.26856164	06	YM	.26641030	06	ZM	.12039731	06	DXM	-.75560138	00	DYM	-.60976630	00	DZM	-.17021993	00
XT	-.26856164	06	YT	.26641030	06	ZT	.12039731	06	DXT	-.75560138	00	DYT	-.60976630	00	DZT	-.17021993	00
RS	.14889752	09	VS	.29927459	02	RM	.39698276	06	VM	.98576022	00	RT	.39698276	06	VT	.98576022	00
GED	.17827595	02	ALT	.39031503	06	LOS	.29778207	03	RAS	.20579013	03	RAM	.13523041	03	LOM	.22722234	03
DUT	.49007604	04	UT	.15000000	02	DR	.22990893	01	SHA	-.38412221	06	DES	-.10683815	02	DEM	.17654770	02

CASE 1

SPACE TRAJECTORIES

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GEOCENTRIC

EPOCH OF PERICENTER	PASSAGE	CONIC	ORBITAL B.T AND B.R	EQUATORIAL COORDINATES
SMA -10378810 06	ECC	JULIAN DATE	2437957.42965858	OCT. 19, 1962
VH -1957239 01	C3	INC	LAN .85036772 02	APF .30779080 03
TA -10430764 03	EA	C1	SLR .22279253 06	APQ .00000000 00
WX -38416634 00	WY	MA	DAO .21528134 02	RAO .15574941 03
QX -49489864 00	QY	WZ	PX .77941747 00	PY .54740047 00
SXD -84815130 00	SY	QZ	RX -.15937591 00	RY .47657078 00
BX .36476786 00	BY	SZ	TX .50521149 00	TY .79176965 00
B.T .13302947 06	B.R	BZ	MX -.63293868 00	MY -.73707163 00
		B	PER .00000000 00	MO .23688411 00
				NOD -.11456707-03

HELIOCENTRIC

EPOCH OF PERICENTER	PASSAGE	CONIC	ORBITAL B.T AND B.R	EQUATORIAL COORDINATES
SMA -17511857 09	ECC	JULIAN DATE	2437978.72300189	NOV. 10, 1962
VH -23473234 02	C3	INC	LAN .27795756 02	APF .21201298 02
TA -21074296 02	EA	C1	SLR .17074400 09	APQ .20279652 09
WX -59324982-02	WY	MA	DAI .26360944 00	RAI .48995488 02
QX -.75464039 00	QY	WZ	PX .65611123 00	PY .75464968 00
SXI .65611123 00	SY	QZ	RX .30427929-02	RY .34510884-02
BX .75464068 00	BY	SZ	TX .75465786 00	TY -.65611853 00
B.T .17290515 09	B.R	BZ	MX -.46824320 00	MY .88350804 00
		B	PER .46259795 03	MZ .12721884-01

HELIOCENTRIC

EPOCH OF PERICENTER	PASSAGE	CONIC	ORBITAL B.T AND B.R	EQUATORIAL COORDINATES
SMA -17511857 09	ECC	JULIAN DATE	2437978.72300189	NOV. 10, 1962
VH -23473234 02	C3	INC	LAN .27795756 02	APF .21201298 02
TA -21074296 02	EA	C1	SLR .17074400 09	APQ .20279652 09
WX -59324982-02	WY	MA	DAI .26360944 00	RAI .48995488 02
QX -.75464039 00	QY	WZ	PX .65611123 00	PY .75464968 00
SXI .65611123 00	SY	QZ	RX .30427929-02	RY .34510884-02
BX .75464068 00	BY	SZ	TX .75465786 00	TY -.65611853 00
B.T .17290515 09	B.R	BZ	MX -.46824320 00	MY .88350804 00
		B	PER .46259795 03	MZ .12721884-01

SELENCENTRIC

EPOCH OF PERICENTER	PASSAGE	CONIC	ORBITAL B.T AND B.R	EQUATORIAL COORDINATES
SMA -19199375 04	ECC	JULIAN DATE	2437978.72300189	NOV. 10, 1962
R -23683385 04	DEC	INC	LAN .27795756 02	APF .21201298 02
R -23683367 04	LAT	C1	SLR .17074400 09	APQ .20279652 09
LTS -15330163 01	LNS	MA	DAI .26360944 00	RAI .48995488 02
ALT -63033853 03	SHA	WZ	PX .65611123 00	PY .75464968 00
HGE -25568633 03	SVL	QZ	RX .30427929-02	RY .34510884-02
SAC .00000000 00		SZ	TX .75465786 00	TY -.65611853 00
		BZ	MX -.46824320 00	MY .88350804 00
		B	PER .46259795 03	MZ .12721884-01

CASE 1 SPACE TRAJECTORIES 5

SELENOCENTRIC		CONIC		CRBITAL R.T AND B.R		EQUATORIAL COORDINATES	
EPOCH OF PERICENTER PASSAGE		JULIAN DATE		LAN		OCT. 21, 1962	
SMA	-42785396 04	INC	.28179120 02	LAN	.2437959.16197626	APF	.14716034 02
VH	10702468 01	C1	.54436868 04	SLR	.60467608 04	APD	.00000000 00
TA	11308407 01	MA	.29342867 00	DAI	.25261183 02	RAI	.82849387 02
WX	17007809 00	WZ	.88147560 00	PX	.82164177 00	PY	.55723827 00
CX	54403885 00	QZ	.45673888 00	RX	-.61625215-01	RY	.43495366 00
SXD	-94523870 00	SZ	.27230437 00	DAO	.15801435 02	RAO	.16922256 03
SXI	11257439 00	SZ1	.42674527 00	TX	.99173047 00	TY	-.74831985-01
DX	97897930 00	BZ	-.20221088 00	MX	-.88147560 00	MY	-.27434253-11
8.T	50556683 04	B	.50863842 04	PER	.17609635 04	DEF	.17125124 00
OPI	00000000 00	OP2	.00000000 00				
BTE	49576106 04	BTO	.50556683 04	BRO	.55814143 03		
GP	24662978 02	THA	.62998919 01				
ZAE	13129025 03	ZAC	.78750643 02	ETE	.16899220 03	ETS	.35127208 03
						ETC	.26503128 03

U MATRIX FOR MAPPING FORWARD											
ITERATION NUMBER 3											
	X	Y	Z	DX	DY	DZ	KE	KM	RI04		
X	-17652444 04	.15848604 04	.95200161 03	-.91048155 00	-.53057C03 00	.56178070-01	.00000000 00	.00000000 00	.00000000 00		
Y	.58312878 03	-.48095709 03	-.31224488 03	.30104389 00	.15852275 00	-.10900034-01	.00000000 00	.00000000 00	.00000000 00		
Z	.88810600 03	-.82228722 03	-.51186704 03	.46401606 00	.27032801 00	-.10934090-01	.00000000 00	.00000000 00	.00000000 00		
DX	-.84523905 06	.80392964 06	.47258491 06	-.43739980 03	-.26872724 03	.24538923 02	.00000000 00	.00000000 00	.00000000 00		
DY	-.23062783 07	.20439737 07	.12555673 07	-.11934008 04	-.68014063 03	.60054422 02	.00000000 00	.00000000 00	.00000000 00		
DZ	.66687538 06	-.61407503 06	-.36038497 06	.34335329 03	.20643462 03	-.23824786 02	.00000000 00	.00000000 00	.00000000 00		
KE	.34039798 02	-.30607792 02	-.18592758 02	.17606430-01	.10201733-01	-.93245179-03	.10000000 01	.00000000 00	.00000000 00		
KM	-.24238281 01	.23390625 01	.18300781 01	-.15201568-02	-.69713592-03	-.13363361-03	.00000000 00	.00000000 00	.00000000 00		
RI04	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
LA04	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
LA05	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
L005	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
LA04 LA05 RIC5 LG04											
X	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
Y	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
Z	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
DX	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
DY	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
DZ	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
KE	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
KM	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
RI04	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
LA04	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
L004	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
LA05	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
L005	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
LA04 LA05 RIC5 LG04											
X	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
Y	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
Z	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
DX	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
DY	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
DZ	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
KE	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
KM	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
RI04	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
LA04	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
L004	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
LA05	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		
L005	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00	.00000000 00		

[illegible]

IMPACT PARAMETERS 62/10/21 155353

N MATRIX (TARGET ORBITAL PLANE)

	B.RO	B.TO	TL	C3	S.TS	S.RS
B.RO	.13498505 04	-.22402019 01	.41325050-01	-.15793145-01	-.18645745 00	-.59219263-02
B.TO	-.22402077 01	.16038554 03	-.45120993-02	-.37801365-01	-.69219189-01	-.15618060-02
TL	.41325051-01	-.45121056-02	.39904870-05	-.30254727-05	-.78761252-05	-.50680620-06
C3	-.15793137-01	-.37801369-01	-.30254775-05	.17535673-04	.22095362-04	.11603023-05
S.TS	-.18645745 00	-.69219182-01	-.78761249-05	.22095361-04	.63648742-04	.19505274-05
S.RS	-.59219254-02	-.15618038-02	-.50680666-06	.11603017-05	.19505277-05	.10676296-06

NORMALIZED N MATRIX

	B.RO	B.TO	TL	C3	S.TS	S.RS
B.RO	.99999999 00	-.48146168-02	.56306379 00	-.10265133 00	-.63612429 00	-.49329858 00
B.TO	-.48146290-02	.10000000 01	-.17835410 00	-.71279338 00	-.68509214 00	-.37742805 00
TL	.56306382 00	-.17835435 00	.10000000 01	-.36167548 00	-.49420229 00	-.77645924 00
C3	-.10265127 00	-.71279345 00	-.36167606 00	.99999997 00	.66137077 00	.84800732 00
S.TS	-.63612430 00	-.68509209 00	-.49420226 00	.66137072 00	.10000000 01	.74825018 00
S.RS	-.49329849 00	-.37742751 00	-.77645994 00	.84800692 00	.74825029 00	.10000000 01

DM/DQO MATRIX

	B.RO	B.TO	TL	C3	S.TS	S.RS
X	.37860242 03	-.62915043 03	-.76171701 03	.11090058-01	.88300154 00	.92214173-02
Y	-.73392525 02	.23021360 03	.22165992 03	-.34133501-02	-.289889519 00	-.26028199-02
Z	-.14238562 03	.28774196 03	.41061202 03	-.57004266-02	-.44743651 00	-.52061935-02
DX	.19943532 06	-.26777504 06	-.40179114 06	.555333881 01	.42461314 03	.50394530 01
DY	.43053032 06	-.83235111 06	-.97959106 06	.14335638 02	.11545693 04	.11866120 02
DZ	-.16147645 06	.22848712 06	.29892461 06	-.43002419 01	-.33374950 03	-.36611142 01

B	.51182302 04
B.RO	.55679747 03
B.TO	.50878539 04
B.RT	.99525261 03
B.TT	.50205437 04
TL	.69771308 02
SMAA	.36740368 02
SMIA	.12664175 02
THETA	.89892090 02
DEL T	.71914333 01
DEL B	.38861755 02
DEL S	.76975188 01

N MATRIX (TARGET EQUATORIAL PLANE)

	B.RT	B.TT	TL
B.RT	.13405460 04	-.10481256 03	.40779151-01
B.TT	-.10481257 03	.16968991 03	-.80733845-02
TL	.40779152-01	-.80733910-02	.39904870-05

APPENDIX H

ODP Format Description

Sheet No. references are to Appendix G. All units are in kilometers and seconds unless otherwise specified.

- Sheet No. 1 Control card input.
- Sheet No. 2 Inverse of the a priori covariance matrix of estimated parameters.
- Sheet No. 3-5 Trajectory based on initial injection conditions before any convergence on data is started. Its format is explained in Appendix D.
- Sheet No. 6 The normal equation coefficients combined with the a priori matrix.
- Sheet No. 7 See the next page of this Appendix for an explanation of the format.
- Sheet No. 8 Covariance matrix of estimated parameters or inverse of Sheet No. 6.
- Sheet No. 9 Correlation matrix of estimated parameters.
- Sheet No. 10 Residual page for a particular station.

The sheet following the residuals has statistics on the previous residuals (self explanatory). The sheets following the statistics will have more residuals and statistics from other tracking stations. The sequence is then repeated for a few more iterations. On the last iteration a trajectory based on the converged estimated parameters is run out to lunar encounter (impact or closest approach) (see Appendix F).

Following the trajectory printout is the U matrix which maps the covariance matrix at injection to encounter. Immediately below the U matrix is the covariance matrix on the estimated parameters at impact or closest approach epoch. This is formed by mapping the covariance matrix at injection to impact in double precision.

*Data have been deleted from the fit.

The sheet following the covariance matrix contains three blocks. The first block is a covariance matrix N formed by mapping the upper 6×6 matrix of the covariance of impact into a new coordinate system. The second block is simply the correlation matrix of the first block covariance matrix. The third block is a mapping matrix which maps injection components into the $B \cdot T, B \cdot R$, etc. system.

- B = The vector measured from the center of the Moon perpendicular to the incoming asymptote in kilometers.
- $B \cdot RO$ = The B vector dotted on the R axis in km (T axis in the Moon's orbital plane).
- $B \cdot TO$ = The B vector dotted on the T axis in km (T axis in the Moon's orbital plane).
- $B \cdot RT$ = The B vector dotted on the R axis in km (T axis in the equatorial plane of the Moon).
- $B \cdot TT$ = The B vector dotted on the T axis in km (T axis in the equatorial plane of the Moon).
- T_L = Linearized time of flight in hours.
- SMAA = The largest eigenvalue of the upper 2×2 of the N matrix (commonly called the semimajor axis of a 40% dispersion ellipse in the B plane).
- SMIA = The semiminor axis of the dispersion ellipse or the other eigenvalue of the upper 2×2 .
- THETA = The orientation angle of the semimajor axis of the dispersion ellipse measured counter-clockwise from the T axis.
- DEL T = Uncertainty in the time of flight in sec.
- DEL B = $(N_{11} + N_{22})^{1/2}$ where N 's are from the first block of this sheet.
- DEL S = V_{∞} (DEL T) The position uncertainty in the direction of the incoming asymptote, where V_{∞} = hyperbolic excess velocity in km/sec.

GMT TC Q FRQ Two-way doppler (HA or Dec)
 XX XX XX X X XXXX.X XXX XX .XXXX^a
 hr min sec Doppler Trans- Last digits Two-way
 count mitting in transmitter Associated Residual
 time, sec station frequency value in cps, weight (observed
 2966 XXXX.X, or hour angle in floating minus
 cps in deg or point calculated), cps
 declination
 in deg
 (floating point
 number)

JOB TITLE

Iteration number	EPOCH	year/month/day	XX XX XX	Clock XXXXXX	SOS ^a XXXXX	QSOs ^b XXXXX
Q	GMT DQ	STDEV DQ	OLD Q	NEW Q	(PC time now) hr min sec NOMINAL Q	Floating pointing numbers DQ (NOM)
X, Y, Z = Position space-fixed cartesian component in km DX, DY, DZ = Velocity S.F.C., km/sec RI = Radius, KE = GM $\oplus$, km km ³ /sec ² LA = Latitude, RE = Radius of deg Earth to scale ephemeris, km LO = Longitude, KM = GM $\oplus$, deg km ³ /sec ²	Difference in esti- mated parameters from previous itera- tion and this iteration	Standard deviations on estimated parameters	Value of estimated parameters from previous iteration (Initial estimate on 1st iteration)	Value of estimated parameters on this iteration	Initial estimate of parameters	Total difference in new Q and nominal Q

^aWeighted sum of the squares of the residuals.^bWeighted sum of the squares of the residuals plus the product $\delta x^T \Gamma^{-1} \delta x$ where δx is the difference in the a priori Q and the value of Q on the particular iteration and Γ is an a priori co-variance on Q.

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