76SDS4263
15 OCTOBER 1976

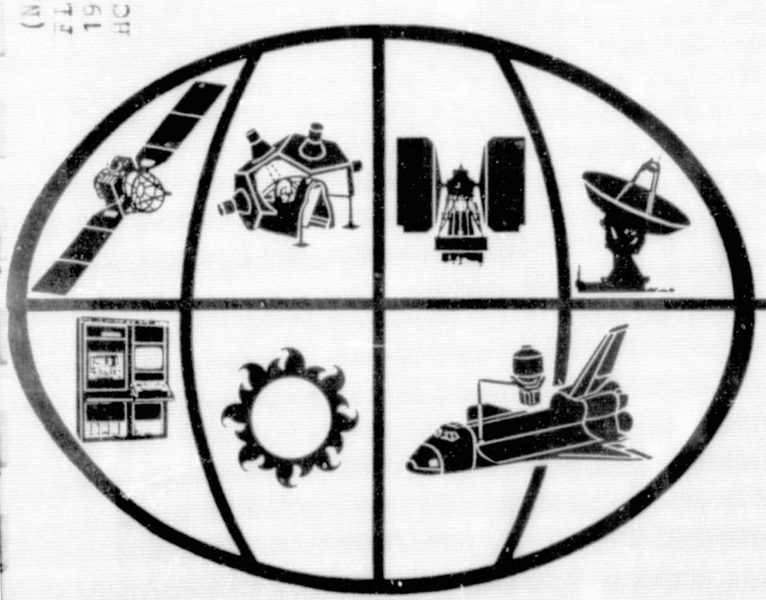
LANDSAT-1 AND LANDSAT-2 FLIGHT EVALUATION REPORT 23 APRIL 1976 TO 23 JULY 1976

Prepared By

GE LANDSAT OPERATIONS CONTROL CENTER

For

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Goddard Space Flight Center
Greenbelt, Maryland 20771



space division

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Contract NAS5-21808

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GENERAL ELECTRIC

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

INTRODUCTION

This is the seventeenth report in a continuing series of documents issued at launch, and thereafter quarterly, to present flight performance analysis of the Landsat-1 Spacecraft. Previously issued documents are:

72SD4255	ERTS-1 Launch and Flight Activation Evaluation Report 23 to 26 July 1972	18 October 1972
72SD4262	ERTS-1 Flight Evaluation Report 23 July 1972 to 23 October 1972	28 November 1972
72SD4224	ERTS-1 Flight Evaluation Report 23 October 1972 to 23 January 1973	27 February 1973
73SD4249	ERTS-1 Flight Evaluation Report 23 January 1973 to 23 April 1973	29 May 1973
73SD4260	ERTS-1 Flight Evaluation Report 23 April 1973 to 23 July 1973	10 August 1973
73SD4274	ERTS-1 Flight Evaluation Report 23 July 1973 to October 1973	28 November 1973
74SD4205	ERTS-1 Flight Evaluation Report 23 October 1973 to 23 January 1974	26 February 1974
74SD4217	ERTS-1 Flight Evaluation Report 23 January 1974 to 23 April 1974	18 May 1974
74SD4236	ERTS-1 Flight Evaluation Report 23 April 1974 to 23 July 1974	15 August 1974
74SD4255	ERTS-1 Flight Evaluation Report 23 July 1974 to 23 October 1974	31 December 1974
75SDS4222	Landsat-1 Flight Evaluation Report 23 October 1974 to 23 January 1975	30 April 1975
75SDS4228	Landsat-1 and Landsat-2 Flight Evaluation Report 23 January 1975 to 23 April 1975	15 August 1975
75SDS4255	Landsat-1 and Landsat-2 Flight Evaluation Report 23 April 1975 to 23 July 1975	10 October 1975
75SDS4266	Landsat-1 and Landsat-2 Flight Evaluation Report 23 July 1975 to 23 October 1975	1 December 1975
76SDS4207	Landsat-1 and Landsat-2 Flight Evaluation Report 23 October 1975 to 23 January 1976	29 February 1976
76SDS4248	Landsat-1 and Landsat-2 Flight Evaluation Report 23 January 1976 to 23 April 1976	14 July 1976

This report contains analysis of performance for Orbits 19100 to 20370 for Landsat-1.

SECTION 1

SUMMARY LANDSAT-1 OPERATIONS

Landsat-1 continues to perform its mission nominally.

The Landsat-1 spacecraft was launched from the Western Test Range on 23 July 1972, at 18:08:06.508Z. The launch and orbital injection phase of the space flight was nominal and deployment of the spacecraft followed predictions. Orbital operations of the spacecraft and payload subsystems were satisfactory through Orbit 147, 3 August 1972, after which an internal short circuit disabled one of the Wideband Video Tape Recorders (WBVTR-2). Operations resumed until Orbit 196, 6 August 1972, when the Return Beam Vidicon failed to respond when commanded off. The RBV was commanded off via alternate commands. Landsat-1 continued to perform its imaging mission with the Multispectral Scanner and the remaining Wideband Video Tape Recorder providing image data. The remaining Wideband Tape Recorder experienced four suspensions of operation, the last being in Orbit 9881 on 2 July 1974, and has not been used operationally since. In Orbit 4396, 3 June 1973, an integrated circuit chip in the TMP failed, disabling four TLM functions. COMSTOR "B" has an intermittent problem with cell 12, which is not being used operationally. The "B" section of the USB with full power output of 1.5 watts was substituted for the "A" section in Orbit 10068, 15 July 1974, because of excessive decline of transmitter power. The pitch flywheel stopped for 2 minutes in Orbit 8040, 20 February 1974; and for 8 hours, 2 minutes in Orbits 11125 to 11130, 29 September 1974. It has been kept close to zero speed ever since, using pitch-bias control. The RMP was switched from B to A in Orbit 11257, 8 October 1974, as a precautionary measure after RMP B began showing current variations. The DCS subsystem was turned off after Orbit 12690, 19 January 1975, and the function assumed by DCS in Landsat-2. Narrow Band Recorder 2 became noisy and was turned off in Orbit 13015, 12 February 1975. Operation of NBR 2 resumed in Orbit 14116, 2 May 1975, until failure in Orbit 15253, 22 July 1975, when its operation was terminated. Battery 6 was turned off between Orbits 13346, 7 March 1975, and 14100, 30 April 1975, due to electrical characteristics causing high temperatures. Between Orbits 14780, 18 June 1975 and 15467, 6 August 1975, Battery 6 was turned off again due to high temperature. Because high current transient occurred at Battery 6 turn on in Orbit 15467, 6 August 1975, the battery turn-on command is temporarily suspended from use. Battery 8 was turned off in Orbit 15588, 15 August 1975, due to electrical characteristics causing high temperature and will not be returned to service because of the battery "ON" command problem. The pitch flywheel stopped again for 45 minutes in Orbit 15309, 26 July 1975, and 3 minutes in Orbit 15312, 26 July 1975. Pitch flywheel motor driver duty cycle remained high from Orbit 15191, 18 July 1975 to Orbit 15393, 1 August 1975, when it returned to normal. MSS operation was suspended during the pitch flywheel anomaly between Orbit 15309, 26 July 1975, and 15393, 1 August 1975. The rear ACS scanner had intermittent electrical failures beginning in Orbit 19078, 21 April 1976, and it failed in Orbit 19086, 22 April 1976. The spacecraft was switched to single scanner mode (forward scanner) in Orbit 19089, 22 April 1976, and normal ACS operation resumed. See Table 1-1 for a summary of payload in-orbit operation.

Table 1-1. In-Orbit Payload System Performance Launch Thru Orbit 20342 (7/21/76) Landsat-1

RBV	Total Scenes Imaged	1690
	AVG. Scenes/Day	139
	Total Area Imaged (millions of sq. mi.)	14.7
	ON TIME (hr.)	14.0
	ON/OFF Cycles	91
	% Real Time Images	57
	% Recorded Images	43
MSS	Total Scenes Images	240,973
	AVG. Scenes/Day	174
	Total Area Imaged (millions of sq. n. mi.)	2101
	ON TIME (hr.)	2,499.4
	ON/OFF Cycles	17,505
	% Real Time Images	81
	% Recorded Images	19
DCS	Messages at OCC	1,152,045
	Non-Perfect MSGS	90,691
	Max. DCP's ACTIVE/DAY	114
	Users	44
	Avg. MSG/ACTIVE Orbit	181
	ON TIME (hr.)	21,820.2
WPA-1	% Real Time Mode	55
	% Playback Mode	45
	ON TIME (hr.)	31.9
	ON/OFF Cycles	312
WPA-2	% Real Time Mode	62
	% P/B Mode	38
	ON TIME (hr.)	2,405.2
	ON/OFF Cycles	15,267
WBVTR-1	% Record Mode	38
	% Playback Mode	41
	% Rewind Mode	21
	% Standby Mode	1
	Minor Frame Sync Error Count in P/B	Failed Orbit 9,881
	Time Head-Tape Contact (hr.)	732.8
	Cycles Head-Tape Contact	11,954
	ON TIME (hr.)	927.6
WBVTR-2	% Record Mode	38
	% Playback Mode	41
	% Rewind Mode	20
	% Standby Mode	1
	MFSE Count in P/B	Failed Orbit 148
	Time Head-Tape Contact (hr.)	5.1
	Cycles Head-Tape Contact	44
	ON TIME (hr.)	6.5

SECTION 2

ORBITAL PARAMETERS

The initial orbit of Landsat-1 required some correction at Orbits 38, 44, and 59 to achieve the desired 18-day repeat cycle. During Orbits 938, 2416, 6390 and 7826 it was necessary to fire the -X thruster of the orbit adjust system to maintain the ground trace in the desired 18-day repeat pattern of $\pm$ 10 nm. On September 29, 1974, the ACS control system fired gas during the spacecraft emergency (pitch flywheel stoppage) which resulted in an unplanned orbit change similar to firing the -X thrusters. The +X thruster was fired during Orbits 11367, 11464, 13611, 19747 and 19871 in order to maintain the 18-day repeat cycle ground trace within $\pm$ 10 nm. Two of the +X firings, i.e., 19747 (8 June 1976) and 19871 (17 June 1976) occurred during this report period.

The orbital parameters are given in Table 2-1. Figure 2-1 shows the longitude error as a function of time and orbit maintenance burns. The longitude error has been maintained with $\pm$ 10 nm in the east-west direction at the equator as planned. Figure 2-2 shows the change of sun time at the descending node. Appendix B gives ground trace repeat cycle predictions.

Table 2-1. Landsat 1 Brouwer Mean Orbital Parameters

Element / Date	Apogee (km)	Perigee (km)	Inclination (Deg.)	Semi Major Axis (km)	Eccentricity	Two Body Period (Min)	Nodal Period (Min)	Argument of Perigee (Deg)	Right Ascension (Deg)	Mean Anomaly (Deg)
25 Oct 1972	917.3	898.1	99.103	7285.859	0.00132	103.152	103.268	93.721	1.060	86.484
25 Jan 1973	922.3	893.1	99.090	7285.865	0.00200	103.153	103.268	133.693	91.805	52.797
25 Apr 1973	911.056	888.763	99.073	7285.767	0.00073	103.151	103.267	168.857	181.411	11.098
25 Jul 1973	914.341	900.810	99.068	7285.741	0.00093	103.150	103.266	95.602	268.944	84.301
25 Oct 1973	922.913	893.229	99.056	7285.786	0.00198	103.151	103.266	65.071	0.291	301.002
25 Jan 1974	915.873	899.111	99.041	7285.657	0.00115	103.148	103.264	160.866	88.606	19.049
24 Apr 1974	920.090	912.672	99.023	7285.691	0.000802	103.149	103.265	117.631	176.743	62.319
23 Jul 1974	922.363	892.629	99.017	7285.661	0.002041	103.148	103.264	109.225	269.779	70.540
23 Oct 1974	918.657	896.316	99.004	7285.652	0.00153	103.148	103.264	150.750	354.743	29.110
24 Jan 1975	914.18	900.67	98.990	7285.590	0.000928	103.147	103.262	278.848	85.403	261.138
24 Apr 1975	914.74	900.05	98.972	7285.559	0.001008	103.146	103.262	37.047	173.043	142.764
25 Jul 1975	915.12	899.63	98.964	7285.541	0.001063	103.145	103.261	138.138	262.528	41.661
23 Oct 1975	914.19	900.54	98.951	7285.531	0.000937	103.145	103.261	250.370	349.952	289.612
24 Jan 1976	914.39	900.32	98.936	7285.523	0.000966	103.145	103.261	2.826	80.147	177.049
24 Jan 1976	914.39	900.32	98.936	7285.523	0.000966	103.145	103.261	2.826	80.147	177.049
23 Apr 1976	915.28	899.41	98.919	7285.511	0.001089	103.145	103.261	110.622	167.275	69.142
22 Jul 1976	914.24	900.35	98.911	7285.464	0.000953	103.144	103.260	218.207	254.289	321.741

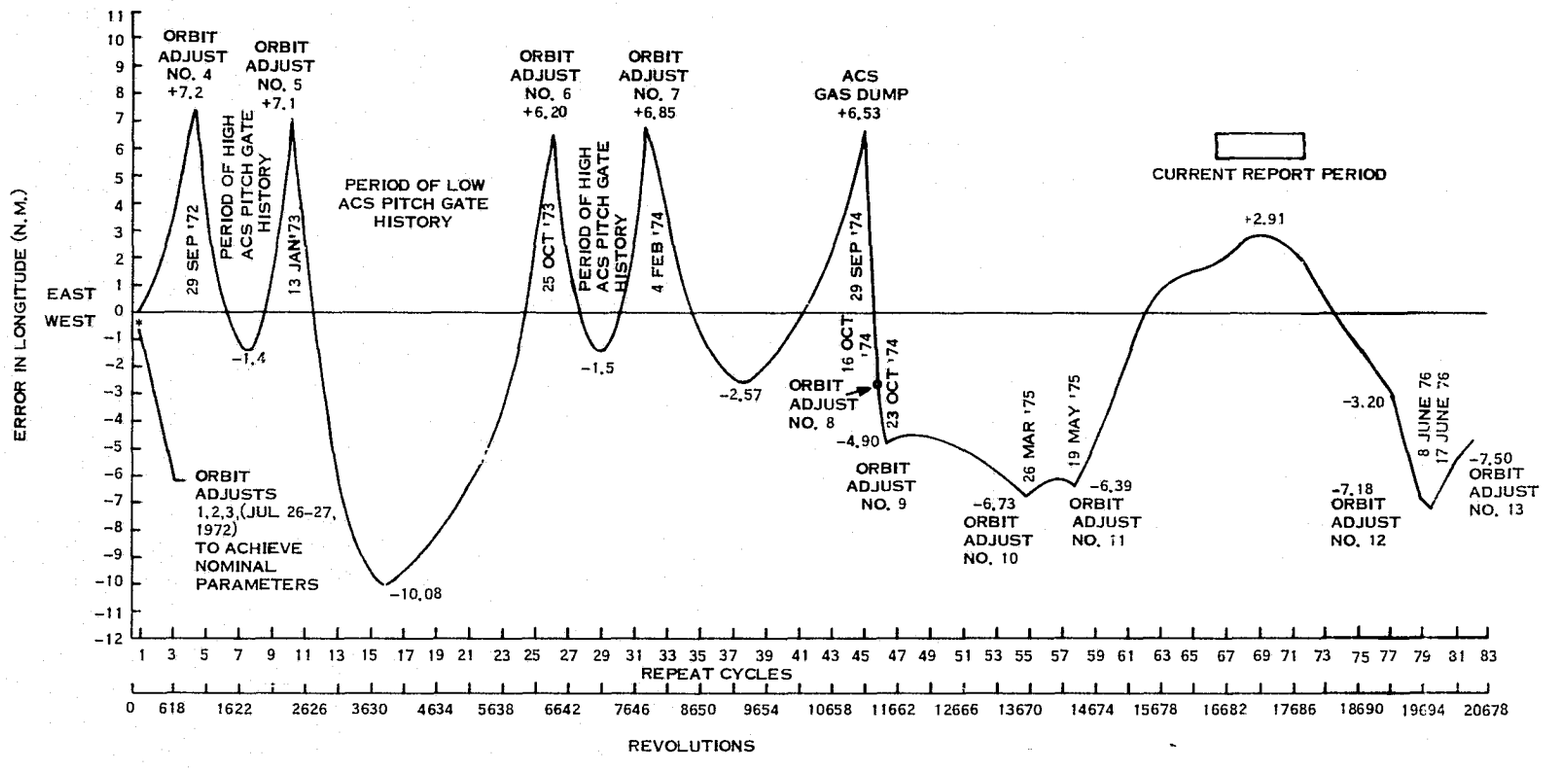


Figure 2-1. Effect of Orbit Adjusts on Landsat 1 Ground Track

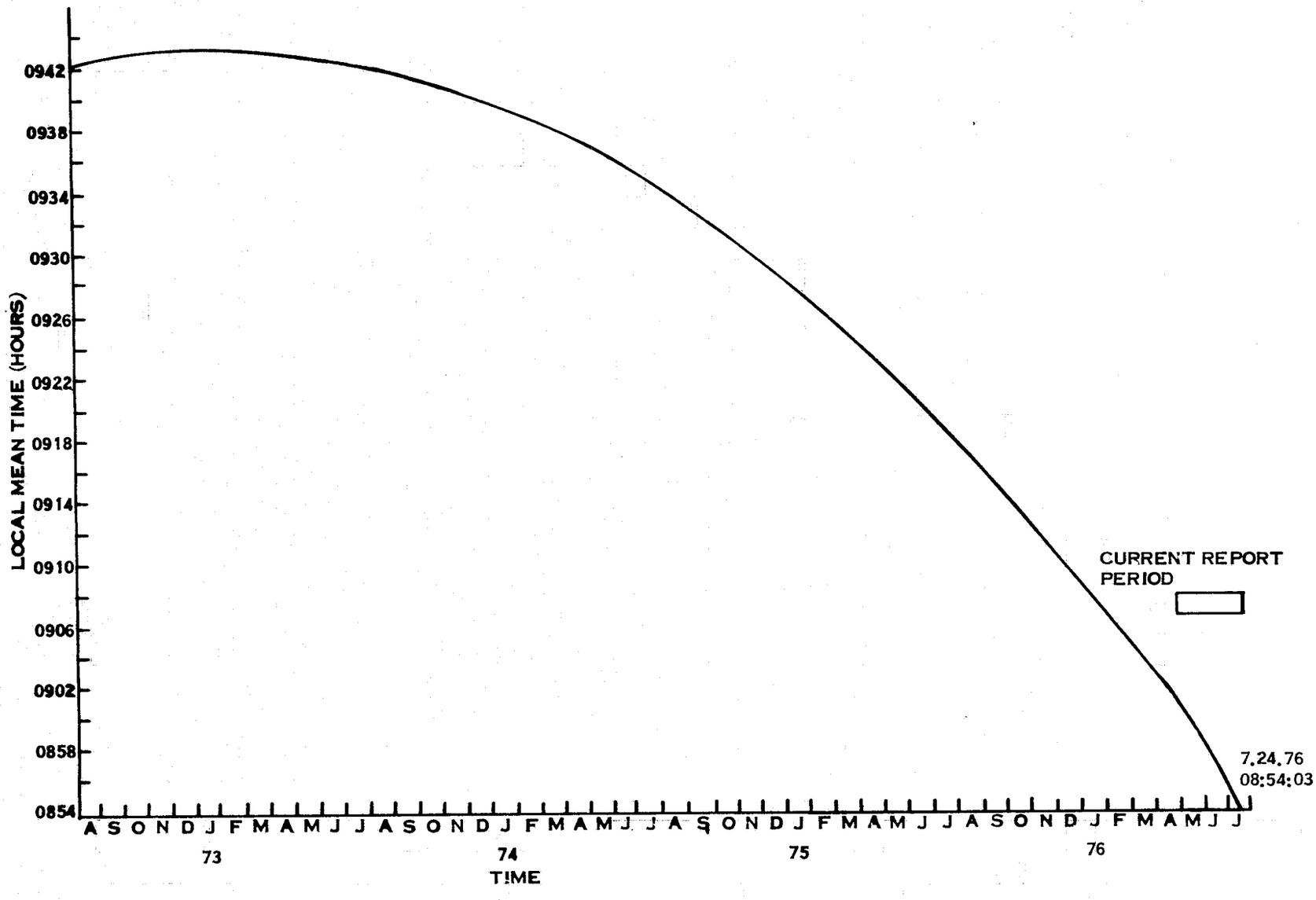


Figure 2-2. Local Mean Time of Descending Node

SECTION 3

POWER SUBSYSTEM (PWR)

The solar array continued to provide excess energy for the payload and spacecraft load throughout this report period. Compensation loads and auxiliary loads dissipated the excess power above the battery and load requirements using Landsat-1 power management procedures. Solar array degradation was 30.3% at the end of 48 months in orbit. The power subsystem is predicted to have adequate power through 1976 for the present Landsat-1 payload configuration, and may extend to 1977 depending on the electrochemical degradation of the battery packs and the effect of increasing sun angle on array tracking.

A plot of measured and predicted midday solar array current is shown in Figure 3-1. Figure 3-2 shows actual and predicted midday solar array degradation. Figure 3-3 shows actual sun angles to the spacecraft and solar panels. Figure 3-4 is a prediction of the variation of sun angle through 1977 for Landsat-1 and 2. It is noted in Figure 3-1 that the high noon solar array current is slightly lower than predicted. This is due to slightly different solar panel sun angles and solar array degradation larger than initially predicted. Solar panel tracking returned to normal in this report period as the sun angle remained below 46°. The solar array current notch of approximately 500 - 600 ma still occurs for a short portion of each satellite day. It does not cause any spacecraft problem as there is still an excess of solar array power as stated earlier.

As of 23 July 1976, the battery system on Landsat-1 has completed 34982 hours of orbital operation. At the completion of about 22970 hours (in Orbit 13346; 7 March 1975) battery 6 was turned off for a restoraction cycle as the battery developed a high C/D ratio, charge share, and temperature. In about 1300 hours, the battery discharged to 26.3 volts (through its small telemetry load) and was restored to service in Orbit 14100, 30 April 1975. However, in the next 1170 hours of operation, the battery showed a recurrence of unhealthy characteristics and was turned off for a second restoration cycle in Orbit 14780, 18 June 1975. The battery discharged to about 26.5 volts in about 1180 hours and was turned on in Orbit 15467, 6 August 1975. The battery turn-on this time was followed by an anomalous time-out of the USB/WPA back-up timer and tripping of the ACS low voltage pneumatics interlock, due to a high transient current occurring simultaneously with the execution of command 353 (all batteries on). The battery, however, has performed satisfactorily since turn-on.

By the time battery 8 was nearing the completion of 26800 hours in orbit, it developed unhealthy characteristics similar to those of battery 6. Therefore, battery 8 was taken off line in Orbit 15588, 15 August 1975. The battery discharged to 26.5 volts in about 1225 hours. Battery 8 turn-on has been deferred to avoid the possible risks involved in the execution of Command 353. The battery probably discharged to zero volts in about 2700 hours (telemetry verification is impossible beacuse the sensor threshold is 19.3 volts).

Since 30 August 1975, the batteries have been kept slightly undercharged to avert the possible recurrence of a run-away condition. Since then, performance of the batteries on line have been good although temperature spread between batteries reached as high as 15.3°C during February 1976 with battery 5 registering the maximum peak temperature of 34.7°C.

The depth of discharge of batteries have typically ranged between 9 and 12%. During the early part of the mission the DOD had peaked up to 15% for individual orbits with heavier payload operation.

As anticipated, battery temperatures have decreased in this report period (see Table 3-1) but are expected to rise in the ensuing months of higher sun intensity and sun angle. Temperature spread between batteries ranged from 5.8 to 7.3° during the current report period. Battery packs averaged a typical 8.0 to 9.0 Depth of Discharge (DOD) with fairly good charge and discharge characteristics for individual batteries.

The power system electronics performed well in this report period with all voltages stable. Table 3-1 shows major power subsystem parameters and Table 3-2 shows power subsystem telemetry for selected orbits. Some parameters in Table 3-2 may slightly different from Table 3-1, because Table 3-1 uses a power management time span (night followed by a day); whereas, the time span used in Table 3-2 is the playback period for the NBR. The Shunt Limiter has not operated since Orbit 3 because the unregulated voltage has been held below cut-in voltage by power management. The spacecraft regulator switched from 2 to 1 on 29 June 1976 due to RF interference triggering an unencoded command switchover. Operation remained normal.

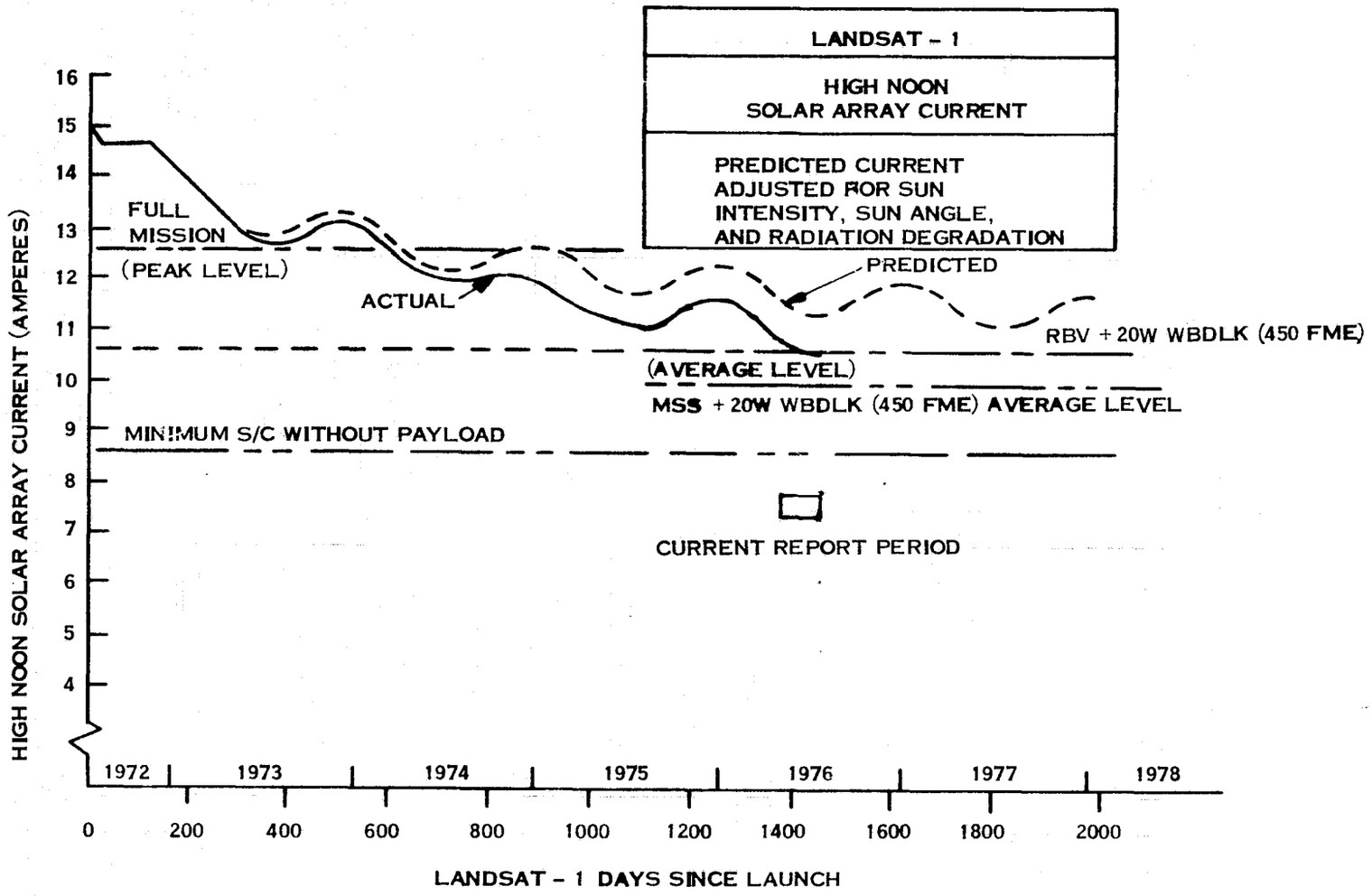


Figure 3-1. Midday Solar Array Current

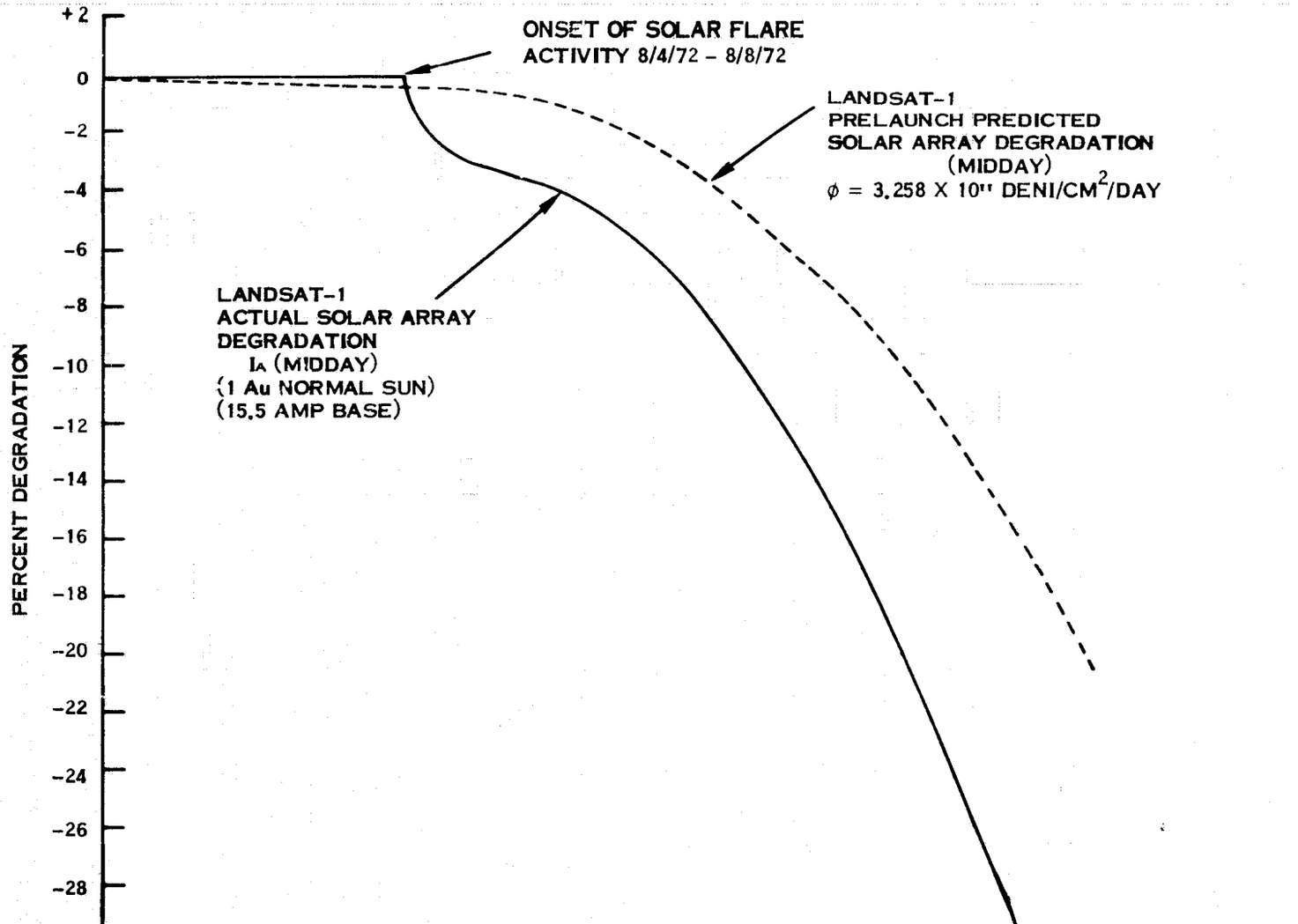


Figure 3-2. I_A (Midday) Degradation vs. Days

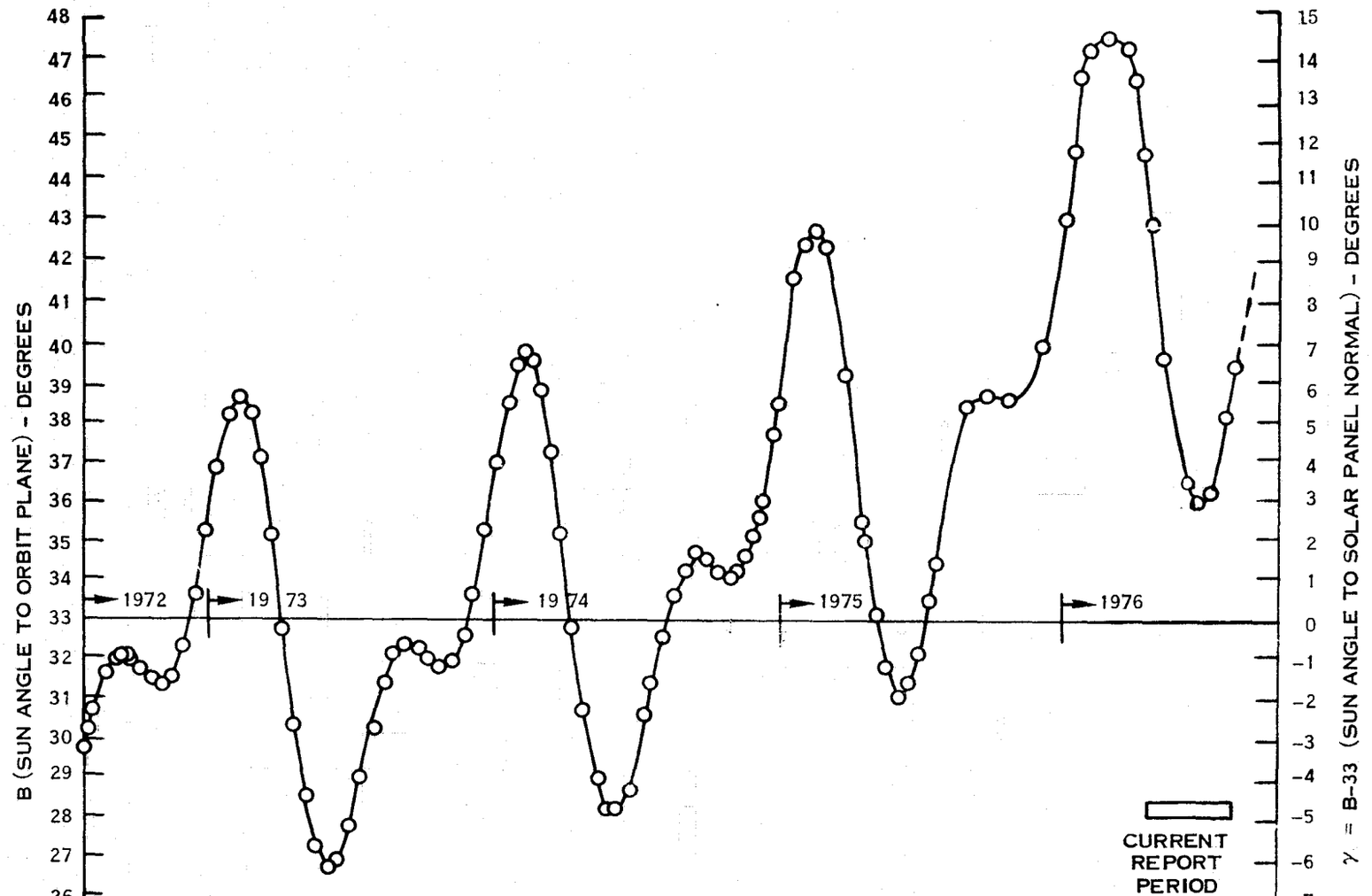
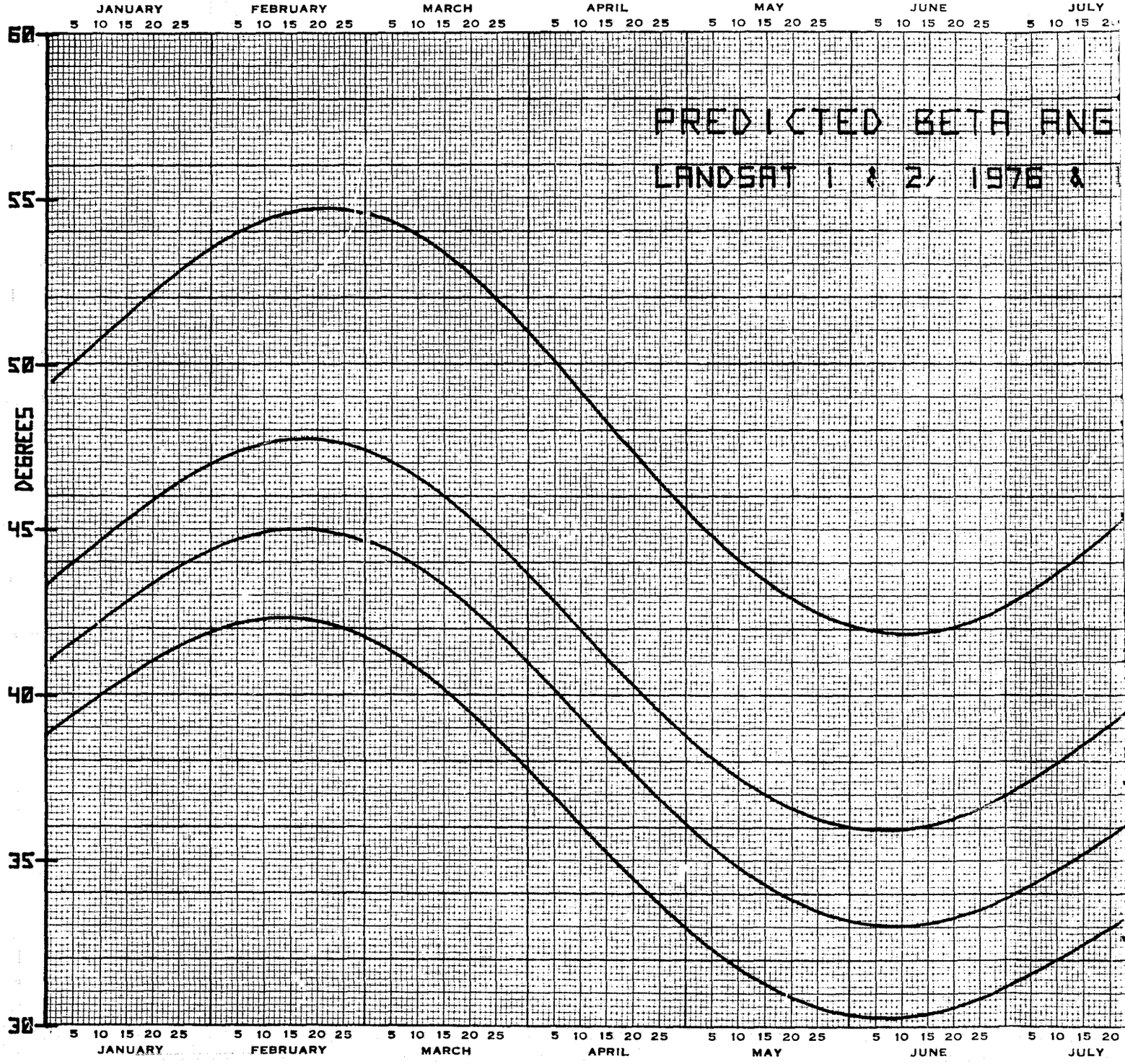


Figure 3-3. Actual β and γ (Paddle) Sun Angles, Landsat-1



FOLDOUT FRAME

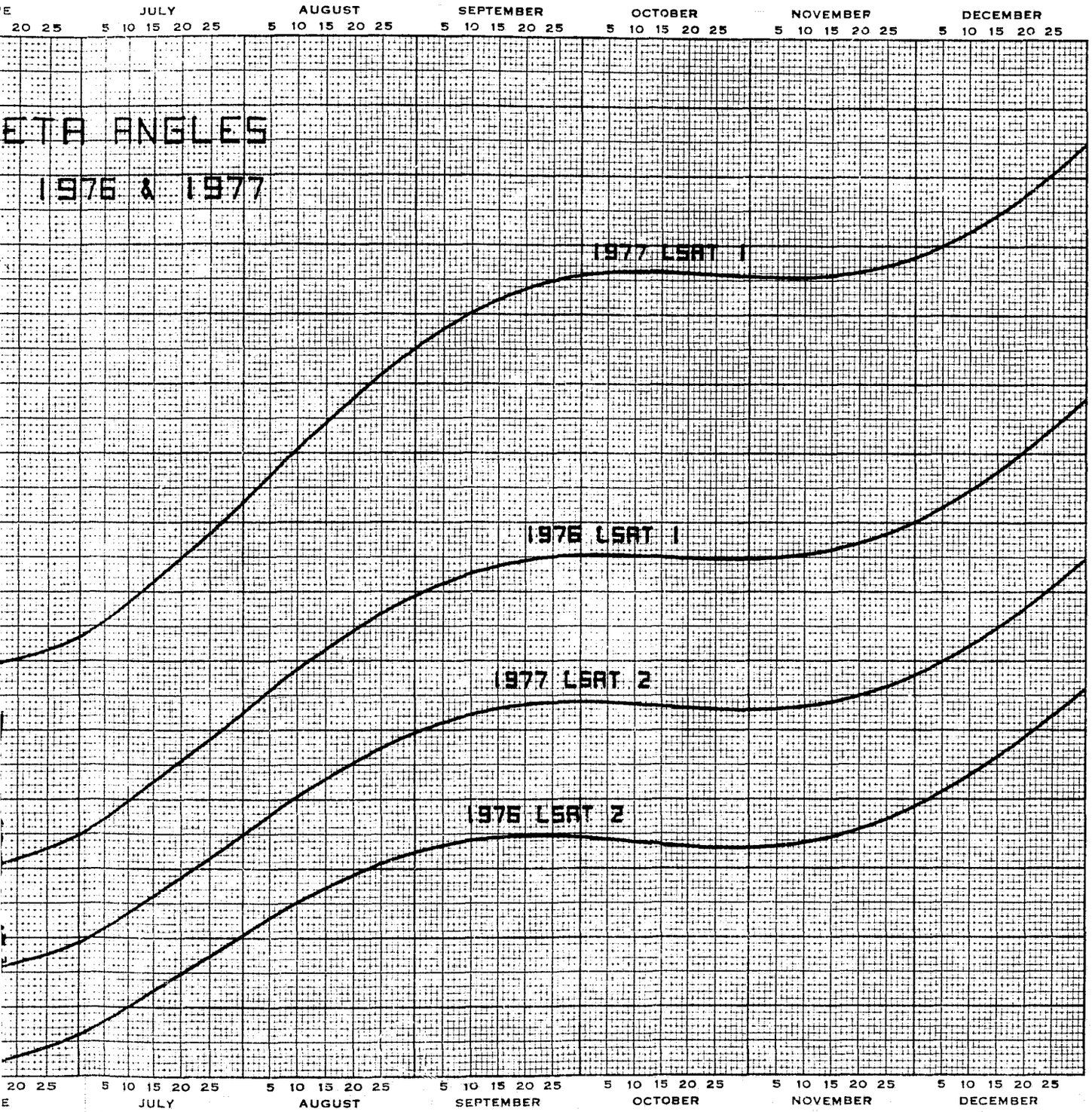


Figure 3-4. Predicted Beta Angles, Landsat 1 & 2, 1976 & 1977

FOLDOUT FRAME 2

FOLDOUT FRAME

Table 3-1. Landsat-1 Major Power Subsystem Parameters

ORBIT NO.	26	5098	10178	15254	17853	19513	19945	20363
BATT 1 MAX	32.48	32.91	33.25	33.16	32.14	32.57	32.48	32.48
2 CHGE	32.48	32.91	33.16	33.16	32.05	32.57	32.48	32.48
3 VOLTS	32.48	32.99	33.25	33.16	32.14	32.57	32.48	32.48
4	32.48	32.99	33.25	33.16	32.14	32.57	32.57	32.48
5	32.48	32.99	33.33	33.25	32.22	32.65	32.57	32.57
6 **	32.31	32.91	33.25	28.21	32.05	32.57	32.48	32.48
7	32.22	32.91	33.25	33.16	32.14	32.57	32.57	32.48
8 ***	32.14	32.91	33.25	33.16	***	***	***	***
AVERAGE +	32.38	32.92	33.25	33.17	32.13	32.58	32.52	32.49
BATT 1 END-	28.81	28.30	28.98	29.15	28.98	29.06	28.64	29.23
2 OF-	28.81	28.30	28.98	29.15	28.98	29.06	28.64	29.23
3 NIGHT	28.81	28.30	28.98	29.15	28.89	28.98	28.64	29.23
4 VOLTS	28.89	28.38	28.98	29.15	28.98	29.06	28.64	29.32
5	28.89	28.38	29.06	29.23	29.06	29.15	28.72	29.32
6 **	28.81	28.30	28.98	28.12	28.98	28.98	28.55	29.23
7	28.81	28.30	28.98	29.15	28.98	29.06	28.64	29.23
8 ***	28.81	28.30	28.98	29.15	***	***	***	***
AVERAGE +	28.84	28.32	28.99	29.16	28.97	29.05	28.64	29.26
BATT 1 (*) CHGE	13.11	13.58	13.96	15.27	13.93	14.49	14.51	14.45
2 SHARE	12.93	13.58	13.96	15.27	13.93	14.49	14.93	15.06
3 (%)	11.38	11.38	11.95	13.59	12.91	13.20	13.51	13.26
4	12.39	11.95	12.28	14.06	13.71	14.47	14.54	14.19
5	12.32	11.85	11.93	13.63	15.13	14.45	14.20	14.32
6 **	12.80	12.35	11.79	**	16.56	14.60	14.18	14.59
7	12.62	12.42	12.13	13.59	13.82	14.29	14.10	14.11
8 ***	12.45	12.10	11.98	14.54	***	***	***	***
BATT 1 LOAD	12.71	12.44	12.58	14.67	13.99	14.30	14.26	14.32
2 SHARE	12.90	13.62	13.70	15.88	14.35	14.56	14.68	14.89
3 (%)	11.43	11.91	12.23	13.85	13.05	13.24	13.43	13.54
4	12.77	13.01	13.12	14.91	14.54	14.82	14.97	14.81
5	12.54	12.42	12.60	14.02	14.85	14.64	14.44	14.31
6 **	12.53	12.21	11.30	**	15.09	14.00	13.77	13.73
7	12.80	12.41	12.50	13.77	14.08	14.39	14.41	14.36
8 ***	12.32	11.98	11.97	12.88	***	***	***	***

4	12.77	13.01	13.12	14.91	14.54	14.82	14.97	14.81
5	12.54	12.42	12.60	14.02	14.85	14.64	14.44	14.31
6 **	12.53	12.21	11.30	**	15.09	14.00	13.77	13.73
7	12.80	12.41	12.50	13.77	14.08	14.39	14.41	14.36
8 ***	12.32	11.98	11.97	12.88	***	***	***	***
BATT 1 TEMP	21.11	24.65	24.76	23.12	23.23	21.14	20.60	21.47
2 IN	18.74	21.42	20.89	19.32	18.44	17.77	17.40	17.81
3 (^{o}C)	18.77	20.29	20.16	18.77	17.67	17.32	16.86	17.25
4	21.57	23.17	23.32	22.71	22.75	21.99	21.44	21.64
5	21.82	23.85	24.09	23.69	30.66	23.65	22.91	24.40
6 **	21.21	24.37	24.78	22.10	29.06	22.83	22.07	23.52
7	21.41	25.01	24.96	23.75	27.40	22.56	21.80	23.23
8 ***	21.82	25.14	25.24	24.59	25.49	21.65	21.24	22.15
AVERAGE	20.81	23.49	23.53	22.26	24.34	21.12	20.54	21.43
S/C REG BUS PWR (W)	176.8	153.4	165.0	137.9	123.1	124.30	124.05	123.49
COMP LOAD PWR (W) (P/O S/C REG BUS PWR)	49.0	34.8	41.9	29.4	17.4	17.4	17.4	17.4
P/L REG BUS PWR (W)	16.2	13.7	8.9	8.9	9.1	9.13	9.12	9.13
C/D RATIO	1.06	1.13	1.21	1.18	1.07	1.04	1.26	1.04
TOTAL CHARGE (A-M)	309.2	290.21	*258.3	229.29	164.92	183.70	221.39	172.42
TOTAL DISCHARGE (A-M)	290.9	256.28	214.2	194.13	153.49	176.44	176.33	168.31
SOLAR ARRAY (A-M)	1044.0	908.0	832.0	876.0	830.0	760	752	754
S.A. PEAK I (AMP)	15.8	13.68	12.44	11.60	11.68	11.20	11.04	10.88
MIDDAY ARRAY I (AMP)	15.01	12.80	N/A	11.04	11.28	10.72	10.64	10.56
SUN ANGLE (DEG)	-3.33	-3.54	-1.82	1.49	13.35	3.5	3.4	6.4
MAX R PAD TEMP (^{o}C)	+62.00	+68.00	63.20	62.0	63.20	59.60	59.60	58.40
MIN R PAD TEMP (^{o}C)	-62.00	-59.00	-42.79	-42.18	-33.68	-40.36	-39.75	-38.54
MAX L PAD TEMP (^{o}C)	+57.90	+60.50	56.00	56.00	63.20	56.00	55.12	55.12
MIN L PAD TEMP (^{o}C)	-67.00	-64.00	-47.00	-46.25	-36.11	-44.00	-44.00	-42.18

* After the telemetry failure in Orbit 4396 Battery 2 charge share was taken equal to Battery 1 charge as an approximation in order to derive a charge share value of each battery.

** Battery 6 turned off in Orbit 14780 was returned to service in Orbit 15467.

*** Battery was turned off in Orbit 15588 and remained off through the end of this report period.

\+ Average of batteries on-line.

FOLDOUT FRAME 2

3-9/10

Table 3-2. Landsat-1 Power Subsystem Analog Telemetry (Average Value for Data Received in NBTR Playback)

Function	Description	Unit	Orbits							
			26	5089	10182	15254	17854	19514	19946	20364
6001	BATT 1 DISC	AMP	0.94	0.81	0.81	0.91	0.75	0.78	0.78	0.81
6002	2		0.95	*	*	*	*	*	*	*
6003	3		0.84	0.78	0.80	0.86	0.70	0.73	0.74	0.75
6004	4		0.93	0.86	0.86	0.92	0.79	0.82	0.84	0.84
6005	5		0.92	0.82	0.82	0.87	0.81	0.81	0.79	0.79
6006	6++		0.91	0.78	0.72	0.00	0.82	0.79	0.78	0.78
6007	7		0.94	0.82	0.80	0.85	0.76	0.79	0.80	0.80
6008	8**		0.91	0.77	0.78	0.80	0.00	0.00	0.00	0.00
6011	BATT 1 CHG	AMP	0.58	0.58	0.69	0.52	0.35	0.38	0.41	0.35
6012	2		0.57	*	*	*	*	*	*	*
6013	3		0.50	0.48	0.60	0.46	0.32	0.35	0.38	0.33
6014	4		0.54	0.51	0.60	0.48	0.34	0.37	0.41	0.35
6015	5		0.54	0.50	0.58	0.46	0.37	0.38	0.40	0.35
6016	6++		0.57	0.52	0.56	0.00	0.40	0.38	0.40	0.35
6017	7		0.55	0.53	0.60	0.46	0.34	0.37	0.40	0.35
6018	8**		0.55	0.52	0.58	0.49	0.00	0.00	0.00	0.00
6021	BATT 1 VOLT	VDC	30.87	31.24	31.64	31.62	30.84	31.19	30.93	31.20
6022	2		30.87	31.25	31.66	31.62	30.83	31.18	30.93	31.19
6023	3		30.87	31.25	31.66	31.62	30.82	31.18	30.92	31.18
6024	4		30.90	31.28	31.70	31.65	30.86	31.21	30.95	31.22
6025	5		30.95	31.33	31.75	31.71	30.92	31.26	31.01	31.28
6026	6++		30.86	31.24	31.65	28.18	30.82	31.17	30.92	31.18
6027	7		30.89	31.27	31.68	31.64	30.86	31.20	30.95	31.21
6028	8**		30.89	31.27	31.68	31.63	-	-	-	-
6031	BATT 1 TEMP	DGC	21.17	24.48	26.09	23.02	23.23	21.17	20.63	21.43
6032	2		18.80	21.29	22.81	19.28	18.44	17.83	17.43	17.80
6033	3		18.76	20.17	21.26	18.76	17.56	17.32	16.90	17.21
6034	4		21.57	23.04	23.83	22.69	22.73	22.00	21.47	21.60
6035	5		21.84	23.77	24.78	23.64	30.63	23.66	22.93	24.36
6036	6++		21.24	24.27	25.78	22.08	29.03	22.85	22.11	23.51
6037	7		21.43	24.38	26.09	23.67	27.41	22.56	21.84	23.18
6038	8**		21.86	25.02	26.21	24.51	25.53	21.66	21.26	22.14
6040	RT PAD TEMP	DGC	25.82	27.22	27.16	27.29	33.36	26.79	27.90	28.21
6041	R PAD V N	VDC	33.40	33.85	34.36	34.18	31.71	33.35	33.10	33.06
6042	R PAD V M	VDC	33.29	33.50	33.60	32.92	31.03	31.97	31.85	31.75
6044	LT PAD TEMP	DGC	14.14	16.61	19.11	19.84	28.96	20.75	21.76	22.62
6045	L PAD V F	VDC	33.69	34.16	34.67	34.63	33.44	34.00	33.71	33.84
6046	L PAD V G	VDC	33.63	34.19	34.72	34.68	33.47	34.04	33.76	33.88

6040	RT PAD TEMP	DGC	25.82	27.22	27.16	27.29	35.30	-6.79	27.90	28.21
6041	R PAD V N	VDC	33.40	33.85	34.36	34.18	31.71	33.35	33.10	33.06
6042	R PAD V M	VDC	33.29	33.50	33.60	32.92	31.03	31.97	31.85	31.75
6044	LT PAD TEMP	DGC	14.14	16.61	19.11	19.84	28.96	20.75	21.76	22.62
6045	L PAD V F	VDC	33.69	34.16	34.67	34.63	33.44	34.00	33.71	33.84
6046	L PAD V G	VDC	33.63	34.19	34.72	34.68	33.47	34.04	33.76	33.88
6050	S/C UR BUS V	VDC	31.24	31.68	32.60	32.07	31.25	31.58	31.36	31.61
6051	S/C RG BUS V	VDC	24.54	24.55	24.55	24.54	24.54	24.54	24.54	24.55
6052	AUX REG A V	VDC	23.41	23.48	23.47	23.49	23.48	23.49	23.48	23.49
6053	AUX REG B V	VDC	23.50	23.50	23.50	23.50	23.50	23.50	23.50	23.50
6054	SOLAR I	AMP	14.87	12.69	11.60	10.83	10.74	10.41	10.36	10.17
6055+	S/C RG BUS I	AMP	7.11	6.27	6.80	5.63	5.03	5.07	5.06	5.04
6056+	S/C RG BUS I	AMP	7.11	6.27	6.79	5.62	5.02	5.06	5.05	5.02
6058	PC MOD T 1	DGC	21.82	22.23	23.22	20.63	19.75	19.47	19.26	19.54
6059	PC MOD T 2	DGC	21.68	22.53	23.00	21.17	20.54	20.21	20.01	20.14
6070	P/L RG BUS V	VDC	24.66	24.68	24.68	24.68	24.66	24.67	24.66	24.67
6071	P/L UR BUS V	VDC	31.08	31.53	31.92	31.92	31.08	31.43	31.20	31.45
6072+	P/L RG BUS I	AMP	0.57	0.56	0.36	0.36	0.38	0.37	0.37	0.37
6073	P AUX A V	VDC	23.51	23.51	23.50	23.50	23.50	23.50	23.50	23.50
6074	P AUX B V	VDC	23.51	23.51	23.50	23.50	23.50	23.50	23.50	23.50
6075	PR MOD T 1	DGC	21.50	23.13	23.62	21.44	21.14	20.75	20.52	20.69
6076	PR MOD T 2	DGC	20.34	21.45	21.84	19.88	19.84	19.37	19.24	19.35
6079	FUSE BLOW V	VDC	24.56	24.57	24.60	24.59	24.57	24.58	24.57	24.58
6080	SHUNT 1 I	AMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6081	SHUNT 2 I	AMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6082	SHUNT 3 I	AMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6083	SHUNT 4 I	AMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6084	SHUNT 5 I	AMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6085	SHUNT 6 I	AMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6086	SHUNT 7 I	AMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6087	SHUNT 8 I	AMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6100	P/L RG BUS I	AMP	0.58	0.56	0.36	0.36	0.38	0.37	0.37	0.37
Total No.	MAJOR FRAMES	FRM	764.0	389.0	384.0	785	787	785	793	788

*Function 6002, 6012; missing data resulted from disabled telemetry resulting from IC chip failure which affected charge current directly and discharge current indirectly.

+FUNC 6055, 6056, 6072 data is derived from Pseudo FUNC 6155, 6156, 6172 used after change to Mode 11.

++Battery 6 turned off in Orbit 14780 was returned to service in Orbit 15467.

**Battery 8 was turned off in Orbit 15588 and remained off through the end of this report period.

FOLDOUT FRAME 2

LS-1

2-11/12

SECTION 4

ATTITUDE CONTROL SUBSYSTEM (ACS)

Landsat-1 separated from the Delta Vehicle on 23 July 1972 at 19:06:35 GMT. The ACS system acquired attitude at 19:07:32 GMT (T_O + 57 Min.) in Pitch, 19:08:02 GMT (T_O + 87 Min.) in Roll and 19:09:15 GMT (T_O + 100 Min.) in Yaw. (T_O = separation time = 19:06:35 GMT.)

Pneumatics expended during acquisition was estimated at 0:52 lb sec in Pitch, 0.12 lb sec in Roll and 0.28 lb sec in Yaw.

After acquisition, all systems functioned within their predicted limits with the exception of the Right Forward Sun Sensor which reached a maximum temperature of 60°C (45°C predicted).

ACS performance through Orbit 2149 (24 December 72) was normal. Commencing with Orbit 2150 (24 December 72) Pitch Flywheel anomalies of varying severities and durations occurred; historically, in Orbits 2150 (24 December 72), 8040 (20 February 74), 9887 (2 July 74) to 9910 (4 July 74), 11125 (29 September 74), 15191 (18 July 75), 15304 (29 July 75), 16557 (24 October 75) to 16613 (28 October 75) and 19060 (20 April 76).

After the Pitch flywheel malfunction in Orbit 11125, gravity gradient torques were substantially utilized to unload spacecraft Pitch axis momentum. The ACS was operated in the Normal mode only during the daily consecutive orbits of MSS activity. While in the Normal mode, pneumatics were limited to a single momentary enable near satellite midnight. In Orbits of non-MSS activity, the ACS was commanded into the Roll Diff Tach High Gain (RDTHG) mode and pneumatics were completely disabled. In order to prevent the Pitch flywheel from seizing at high rate, its speed was limited between -10 RMP and -100 RPM by commanding $\pm$ 0.6° PPB as required, except during periods of MSS operations.

Presently (Orbit 20370, 23 July 76) Pitch flywheel duty cycle has been averaging less than 5% in both rotational directions.

A slow pressure leak in the Forward Scanner was detected in Orbit 5099 (24 July 73); however, it has had no effect on the scanner's performance. During this report period, Forward Scanner pressure has decreased from 2.61 psia in Orbit 19102 (23 April 76) to 2.56 psia in Orbit 20420 (26 July 76). Generally, all spacecraft pressures and temperatures are satisfactory.

During Orbit 11257 (8 October 74), current variations appeared in RMP #2. RMP #1 was substituted as the prime subsystem and has been functioning normally.

Landsat-1 Sun Sensors were affected by a seasonably high Beta angle between 4 February 1976 (Orbit 17993) and 2 March 1976 (Orbit 18369) and Solar Array tracking deteriorated when the ACS was in Normal mode. A tracking error of up to 48° (leading) built up in the Right Solar Array while the Left Solar Array lagged normal position by 7° to 10°.

The SADS are currently operating normally and the sun sensors are tracking the sun accurately with Beta angle at 39.5° (23 July 1976).

On June 8, 1976, Beta angle passed through 36°. This is the lowest value it will ever be for the remainder of Landsat-1's life.

Beta angle will continue to increase cyclically and when it is approximately 43.5° (August 27, 1976) - with the ACS in Normal mode - sun sensor input will diminish and solar array tracking will degrade.

In orbit 19089 (22 April 1976), the ACS was commanded into the Forward Single Scanner mode after the Rear Scanner performed erratically for several orbits.

ACS performance in this mode has been normal and spacecraft attitude is being maintained accurately.

Early in Landsat-1's life, it was observed that pneumatic gating frequency was related to the seasons of the year. Maximum +Pitch and -Roll rating occurred during January, while minimum gating occurred in June.

Currently, pneumatic gating is limited to a single momentary enable per orbit at satellite midnight providing the ACS is in the Normal mode. Segmented NBTR coverage is scheduled for these times and all gating is recorded.

Figure 4-1 is a graph of freon tank pressure as a function of time.

Figure 4-2 predicts Landsat-1's remaining freon life as a function of gating frequency and Figure 4-3 plots remaining Roll gates as a function of tank pressure.

Tables 4-1, 4-2 and 4-3 are a summary of Landsat-1's Attitude Control Subsystem Telemetry.

Table 4-1. Landsat-1 ACS Temperature and Pressure Telemetry Summary

Function	Units	Orbit							
		31	5099	10182	15254	17826	19514	19946	20364
1084 RMP 1 Gyro Temperature	DGC	44.5	23.06	21.22	42.40	43.32	42.09	42.03	41.47
1094 RMP 2 Gyro Temperature	DGC	74.3	75.10	43.45	24.05	25.68	24.13	23.88	23.49
1222 SAD RT MTR HSING Temp	DGC	21.1	22.00	20.55	22.89	23.57	22.39	22.29	21.70
1242 SAD LT MTR HSING Temp	DGC	27.0	30.38	28.18	29.53	31.31	29.49	29.24	28.88
1223 SAD RT MTR WNDNG Temp	DGC	25.3	26.54	24.63	27.06	27.15	26.54	26.54	25.74
1243 SAD LT MTR WNDNG Temp	DGC	28.7	32.92	30.32	31.98	33.9	32.10	31.90	31.40
1228 SAD RT HSG Pressure	PSI	7.6	7.35	7.12	6.88	6.80	6.71	6.70	6.70
1248 SAD LT HSG Pressure	PSI	7.0	6.86	6.47	6.18	6.10	5.93	5.92	5.90
1007 FWD Scanner MTR Temp	DGC	19.8	19.88	18.46	20.36	20.67	19.74	19.64	19.16
1016 Rear Scanner MTR Temp	DGC	20.5	19.83	17.86	19.24	20.19	19.50	19.35	18.87
1003 FWD Scanner Pressure	PSI	4.6	4.02	3.50	3.00	2.80	2.60	2.60	2.60
1012 Rear Scanner Pressure	PSI	7.8	7.87	7.44	6.97	6.96	6.74	6.74	6.74
1212 Gas Tank Pressure	PSI	1988.0	1702.34	1454.19	235.44	186.06	161.71	161.42	162.92
1210 Gas Tank Temperature	DGC	22.6	24.30	22.56	24.36	25.30	23.88	23.77	23.22
1213 Manifold Pressure	PSI	56.7	57.44	58.73	61.67	61.67	61.67	61.67	61.66
1211 Manifold Temperature	DGC	21.9	23.62	21.77	23.82	24.97	23.41	23.16	22.69
1059 CLB Power Supply Card Temp	DGC	37.1	40.54	38.83	40.58	41.66	40.26	40.00	39.55
1260 ACS Baseplate 1	DGC	25.4	27.93	25.36	26.54	28.57	26.62	26.38	26.01
1261 ACS Baseplate 2	DGC	22.9	24.73	23.00	25.05	26.65	24.83	24.68	24.21
1262 ACS Baseplate 3	DGC	23.4	23.69	21.97	24.95	26.00	24.65	24.45	23.89
1263 THO1 STS	DGC	-6.8	-0.97	-3.41	1.22	7.58	2.58	2.12	1.86
1264 THO2 STS	DGC	-14.6	-9.42	-8.27	-4.50	1.74	- 2.99	- 3.32	- 3.17
1265 THO3 STS	DGC	-3.1	9.31	7.58	12.92	19.67	14.55	14.52	15.02
1266 THO4 STS	DGC	-13.9	2.85	-1.85	2.40	7.06	3.32	3.43	3.05
1267 THO5 STS	DGC	-8.9	-1.16	-5.17	2.92	13.56	5.84	5.02	4.80
1224 SAD R FSST	DGC	39.5	60.21	63.25	64.74	64.16	65.23	64.40	62.86
1244 SAD L FSST	DGC	27.1	51.11	53.21	54.69	59.65	55.68	53.32	53.22

*Pressure DROP due to PCM count step, not to loss of freon

Table 4-2. Landsat-1 ACS Voltages and Currents

Function	Units	Orbit							
		31	5099	10182	15254	17826	19514	19946	20364
1057 CLB Power Supply Volts	TMV	2.8	2.78	2.78	2.78	2.78	2.77	2.77	2.77
1081 RMP 1 MTR Volts	VDC	OFF	OFF	OFF	-30.14	-30.14	-30.14	-30.14	-30.14
1082 RMP 1 MTR Current	Amps	OFF	OFF	OFF	.11	0.11	0.11	0.11	0.11
1080 RMP 1 Supply Volts	VDC	OFF	OFF	OFF	-23.78	-23.76	-23.78	-23.78	-23.79
1091 RMP 2 MTR Volts	VDC	-29.7	-29.63	-29.63	OFF	OFF	OFF	OFF	OFF
1092 RMP 2 MTR Current	Amps	0.10	0.10	0.11	OFF	OFF	OFF	OFF	OFF
1090 RMP 2 Supply Volts	VDC	-23.4	-23.41	-23.50	OFF	OFF	OFF	OFF	OFF
1320 SAD RT MTR WNDNG Volts	VDC	-4.8	-4.25	-3.89	-3.85	-3.65	-3.96	-4.26	-4.20
1240 SAD LT MTR WNDNG Volts	VDC	-4.8	-4.09	-3.36	-3.43	-3.37	-3.56	-3.65	-3.65
1227 SAD RT -15 VDC Conv.	VDC	14.9	14.88	14.89	14.87	14.87	14.87	14.87	14.87
1247 SAD LT -15 VDC Conv.	VDC	15.2	15.13	15.14	15.06	15.10	15.10	15.11	15.11
1056 CLB ± 6 VDC	TMV	2.4	2.35	2.35	2.35	2.35	2.35	2.35	2.35
1055 CLB ± 10 VDC TMV	TMV	2.75	2.75	2.74	2.74	2.74	2.74	2.73	2.73

Table 4-3. Landsat-1 ACS Attitude Errors and Driver Duty Cycle

Function	Units	Orbits							
		13198	13569	14001	15254	17826	19514	19946	20364
1141 Pitch Fine-Error *	DEG	- 0.40	- 0.08	- 0.02	- 2.13	0.80	- 0.40	- 0.45	- 0.11
1143 Pitch Flywheel Speed	RPM	- 10.49	- 26.86	- 1.21	12.92	- 66.00	- 85.52	- 85.32	- 76.17
1038 Pitch MTR DRVR CCW	PCT	4.96	5.81	4.55	3.28	2.52	2.80	2.69	2.69
1039 Pitch MTR DRVR CW	PCT	2.29	2.17	5.10	19.65	0.58	1.29	1.35	1.04
1030 Roll Fine Error **	DEG	- 2.25	- 0.20	- 0.20	- 2.52	- 2.86	- 2.63	- 2.71	- 2.70
1127 Roll Rear Flywheel Speed	RPM	715.78	756.92	782.08	714.05	734.39	718.05	721.49	720.23
1126 Roll Fwd Flywheel Speed	RPM	641.82	674.47	693.31	641.32	643.76	641.26	641.16	640.80
1022 Roll Rear MTR DRVR CCW	PCT	0.01	0.68	0.90	.13	0.00	1.07	1.30	0.96
1025 Roll Rear MTR DRVR CW	PCT	4.26	5.22	5.52	4.17	4.57	5.73	5.80	5.61
1023 Roll Fwd MTR DRVR CCW	PCT	0.01	0.66	0.72	.08	0.00	1.10	1.29	0.99
1024 Roll Fwd MTR DRVR CW	PCT	4.15	4.94	5.35	4.24	4.11	5.26	5.28	5.16
1035 Yaw Tach	RPM	-206.08	-116.50	- 93.72	-169.52	-199.31	-206.53	-198.81	-200.01
1033 Yaw MTR DRVR CW	PCT	0.04	1.53	1.84	.09	0.05	0.09	0.09	0.05
1034 Yaw MTR DRVR CCW	PCT	0.07	1.60	1.76	.68	0.57	0.74	0.72	0.67
1221 SAD Right Tach	DEG/MIN	3.37	3.37	2.81	3.37	3.41	3.39	3.38	3.40
1241 SAD Left Tach	DEG/MIN	2.80	2.81	2.81	2.79	2.76	2.79	2.79	2.79

NOTE: Tabulation of these functions began after the pitch flywheel anomaly (stopped) in Orbit 11125.

* Pitch Fine Error is high due to use of Pitch Position Bias (PPB) to control Pitch wheel speed on some orbits which raise the average error above that of normal attitude without PPB.

** Roll Fine Error is high due to use of High Gain Roll Differential Tachometer mode to control Roll wheel speed which raises the average error above that of normal attitude in Normal Gain Roll Differential Tachometer mode.

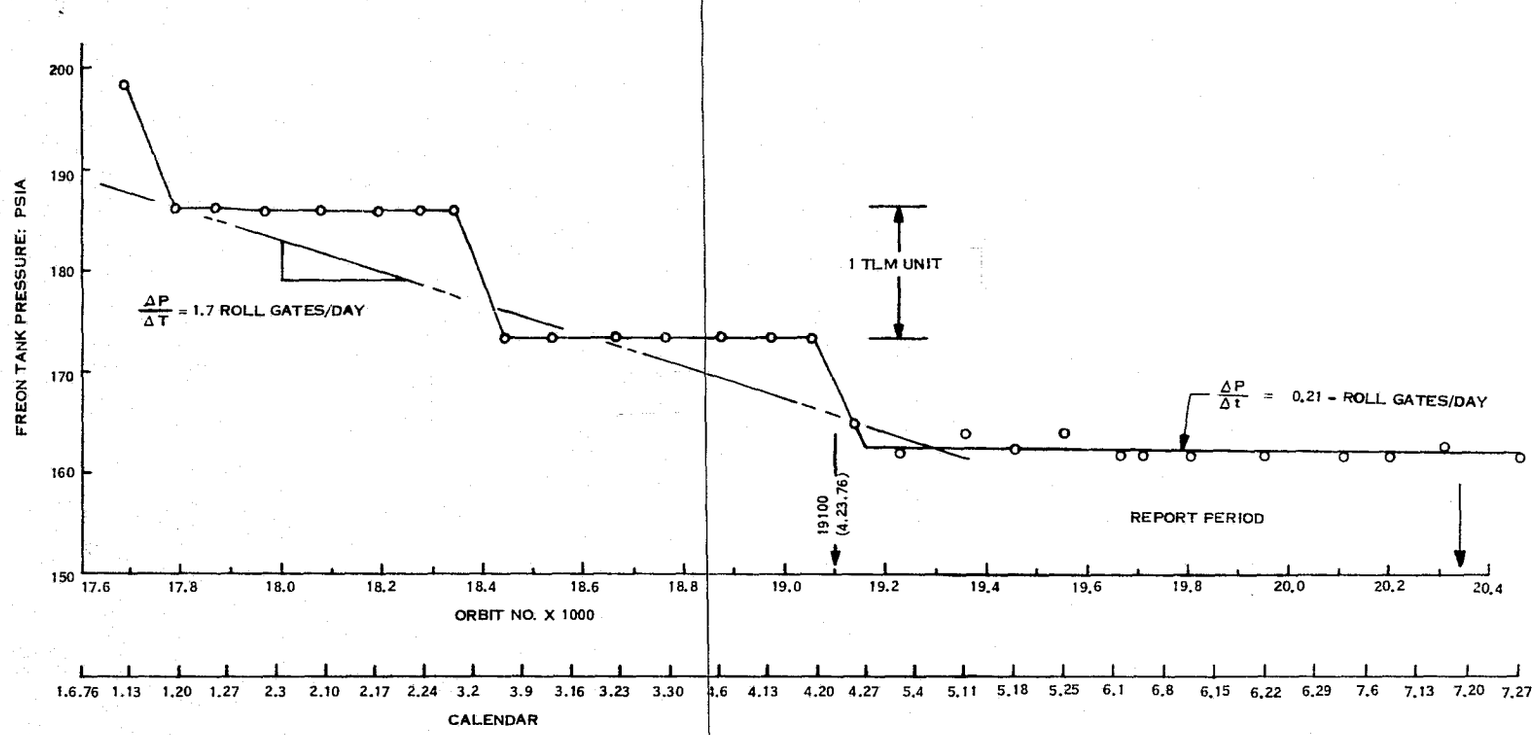


Figure 4-1. Landsat-1 Freon History
(Telemetry Values)

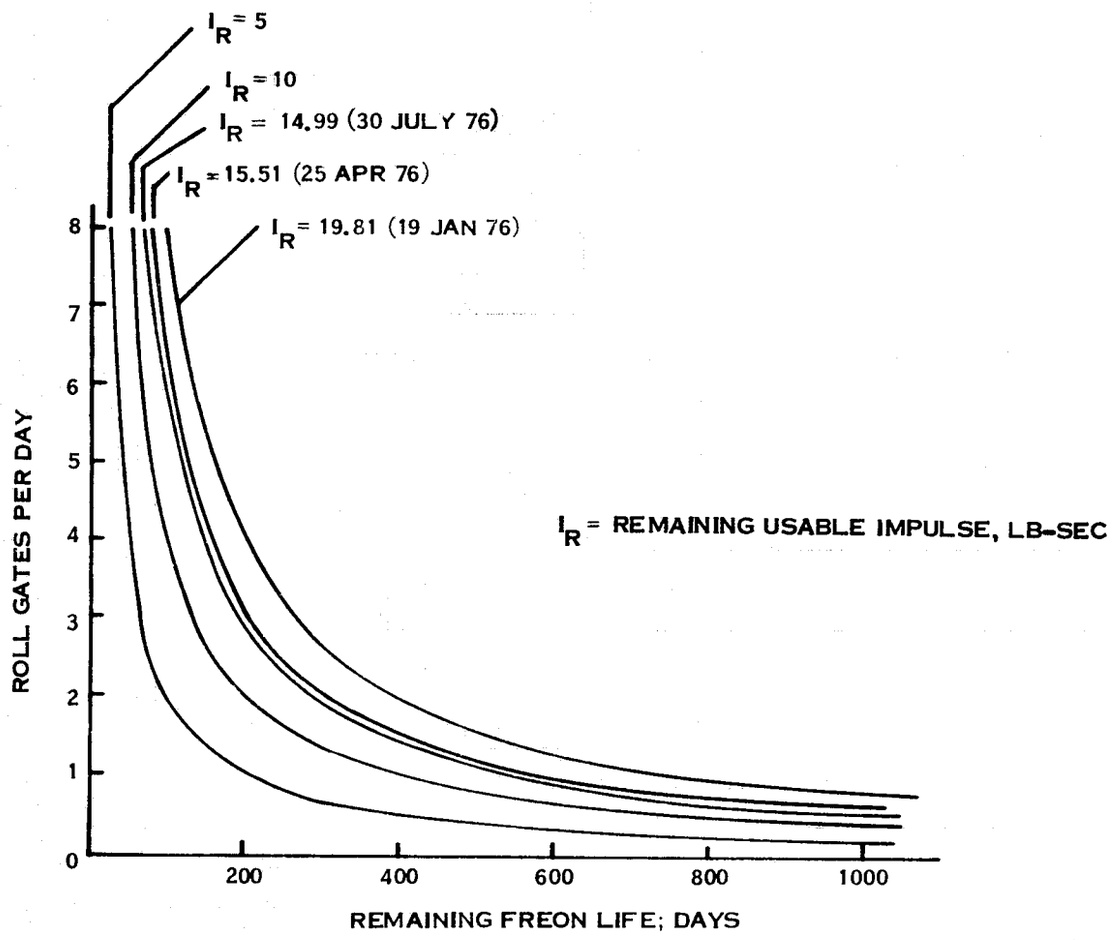


Figure 4-2. Remaining Freon Life vs. Gating Frequency

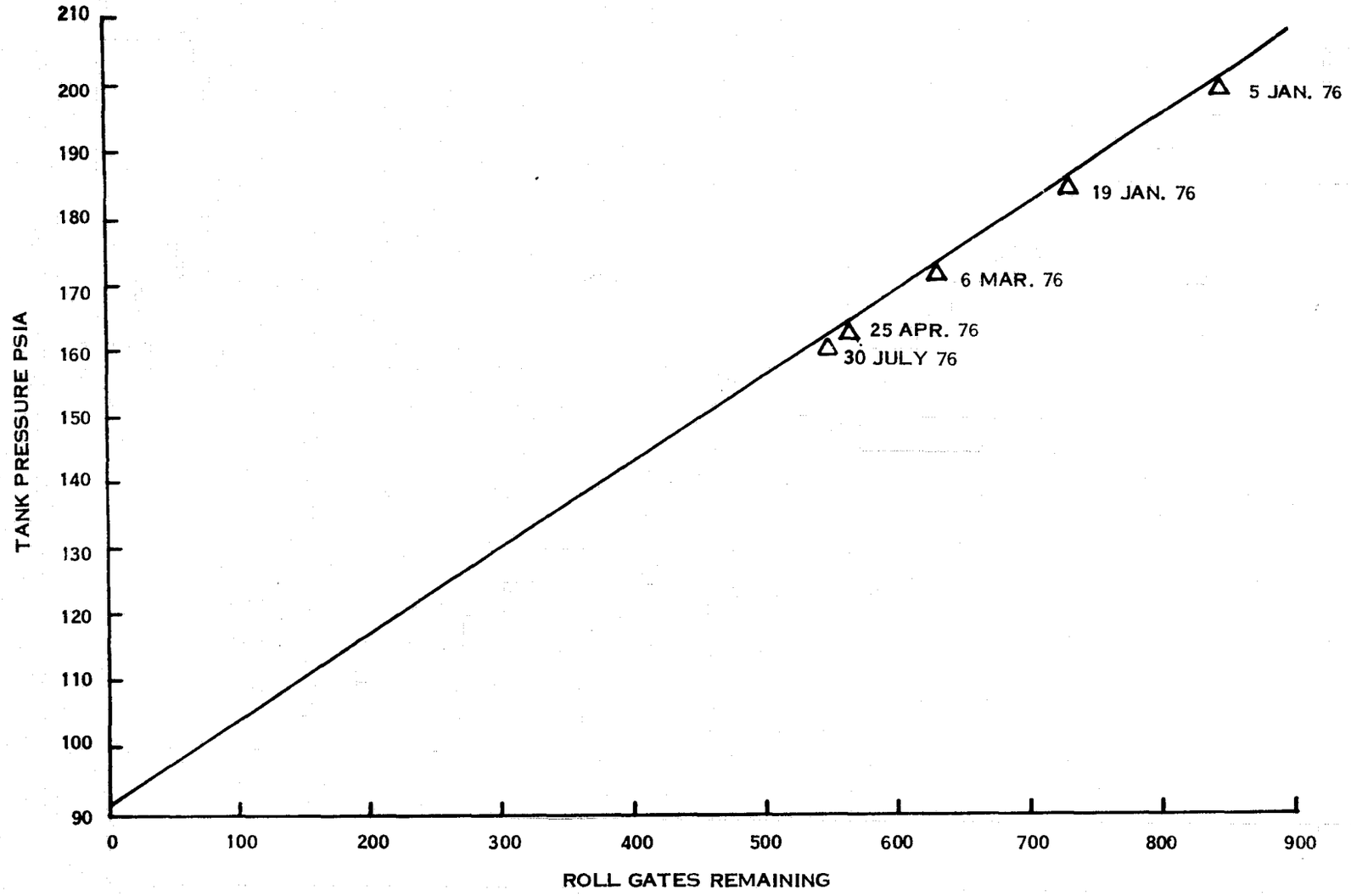


Figure 4-3. Landsat-1 Pressure Roll Gate Prediction

SECTION 5

COMMAND CLOCK SUBSYSTEM (CMD)

The Command Clock subsystem has operated normally throughout the four years in orbit, with the exception of cell 12 in Comstor "B" (incorrect time tags occurred August 3, 1972). Missed commands were ocasionally noted but they were well within the expected probability for the equipment.

The Command Clock Subsystem operated nominally in this report period. A clock update was made in Orbit 19844. Figure 5-1 shows the history of the S/C clock drift since launch.

Figure 5-2 shows the cumulative drift since launch (15.65 seconds slower in 48 months). The rate of drift averaged 0.786 msec slow per orbit. In this period, the drift rate appears to be declining, and is at the average rate of 0.423 msec slow per orbit.

Table 5-1 shows typical telemetry values since launch. All are nominal.

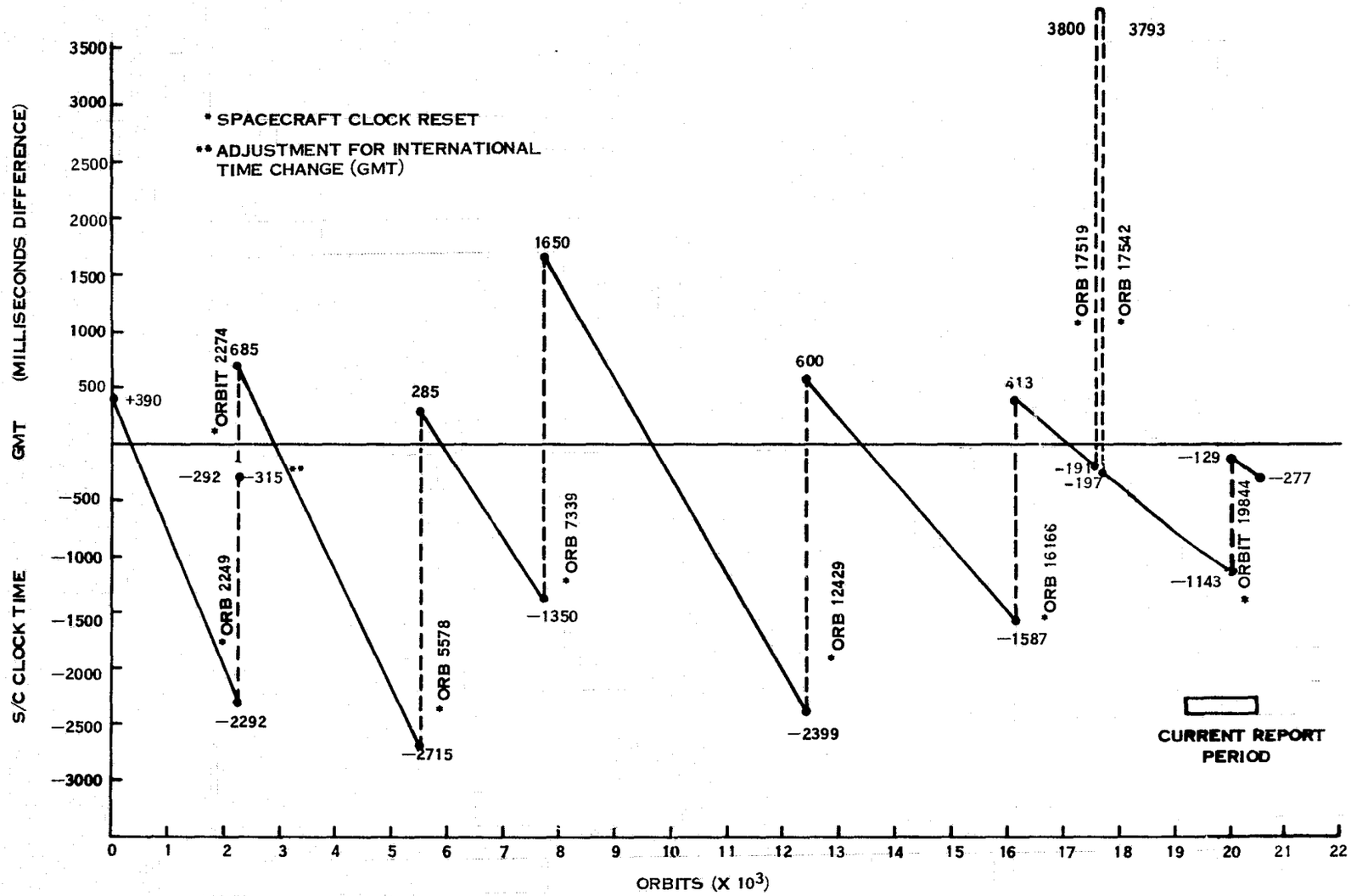


Figure 5-1. Landsat-1 Spacecraft Clock Drift History

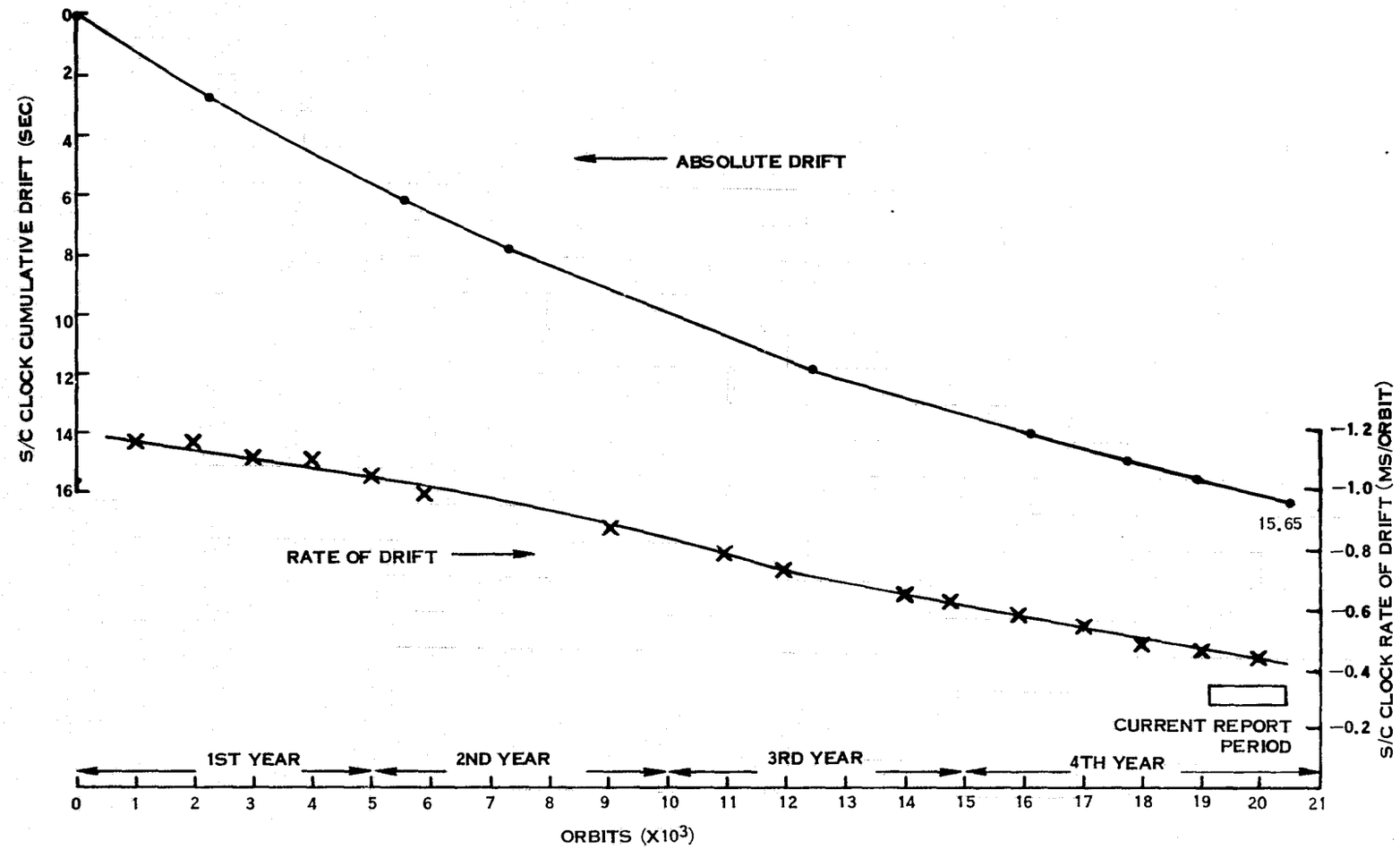


Figure 5-2. Landsat-1 Spacecraft Drift and Drift Rate

Table 5-1. Landsat-1 Command Clock Telemetry Summary

Function No.	Name	Mode	Units	Orbit							
				35	5099	10182	15233	17824	19514	19946	20364
8005	Pri. Power Supply Temp	-	°C	37.31	39.37	39.50	38.26	37.63	38.36	38.16	38.06
8006	Red. Power Supply Temp	-	°C	35.73	38.08	38.38	37.06	36.99	37.58	37.42	37.33
8007	Pri. Osc. Temp	-	°C	31.14	31.98	32.11	31.14	31.11	31.10	31.03	31.04
8008	Red. Osc. Temp	-	°C	30.47	31.39	31.42	30.48	30.48	30.47	30.20	30.18
8009	Pri. Osc. Output	-	TMV	0.95	0.96	0.97	0.97	0.97	0.95	0.95	0.95
8010	Red. Osc. Output	-	TMV	**	**	**	**	**	**	**	**
8011	100 kHz	Pri.-Red.	TMV	3.11	3.10	3.11	3.12	3.12	3.10	3.10	3.11
8012	10 kHz	Pri.-Red.	TMV	3.10	3.07	3.08	3.08	3.08	3.07	3.08	3.08
8013	2.5 kHz	Pri.-Red.	TMV	2.95	2.95	2.95	2.96	2.96	2.95	2.95	2.95
8014	400 Hz	Pri.-Red.	TMV	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40
8015	Pri. +4 V Power Supply	Pri. Clk ON	VDC	4.10	4.10	4.10	4.10	4.10	4.07	4.08	4.08
8016	Red. +4 V Power Supply	Red. Clk ON	VDC	3.95	3.95	3.95	3.95	3.94	3.92	3.92	3.92
8017	Pri. +6 V Power Supply	Pri. Clk ON	VDC	6.06	6.07	6.07	6.11	6.10	6.06	6.06	6.06
8018	Red. +6 V Power Supply	Red. Clk ON	VDC	6.00	5.94	5.94	5.97	5.96	5.93	5.93	5.93
8019	Pri. -6 V Power Supply	Pri. Clk ON	VDC	-6.02	-6.02	-6.03	-6.04	-6.03	-6.02	-6.02	-6.02
8020	Red. -6 V Power Supply	Red. Clk ON	VDC	-5.99	-6.00	-6.00	-6.01	-6.00	-5.99	-5.99	-5.99
8021	Pri. -23 V Power Supply	Pri. Clk ON	VDC	-22.88	-22.89	-22.89	-22.95	-22.92	-22.88	-22.88	-22.88
8022	Red. -23 V Power Supply	Red. Clk ON	VDC	-22.98	-23.00	-23.01	-23.06	-23.04	-22.99	-22.99	-22.99
8023	Pri. -29 V Power Supply	Pri. Clk ON	VDC	-29.13	-29.16	-29.15	-29.15	-29.13	-29.15	-29.15	-29.16
8024	Red. -29 V Power Supply	Red. Clk ON	VDC	-29.07	-29.21	-29.21	-29.21	-29.21	-29.21	-29.21	-29.21
8101	CIU A -12 V	CIA A ON	VDC	-12.33	-12.33	-12.34	-12.35	-12.35	-12.34	-12.34	-12.34
8102	CIU B -12 V	CIU B ON	VDC	-12.26	-12.26	-12.23	-12.20	-12.26	-12.24	-12.23	-12.24
8103	CIU A -5 V	CIU A ON	VDC	-5.32	-5.34	-5.34	-5.34	-5.34	-5.34	-5.34	-5.34
8104	CIU B -5 V	CIU B ON	VDC	-5.31	-5.31	-5.31	-5.31	-5.31	-5.31	-5.31	-5.31
8105	CIU A Temp	CIU A ON	°C	24.47	24.77	25.04	24.09	24.58	24.41	24.15	24.11
8106	CIU B Temp	CIU B ON	°C	24.96	25.31	25.45	24.48	24.92	24.75	24.49	24.44
8201	Receiver RF-A Temp	-	°C	**	**	28.67	27.53	27.14	27.09	26.85	26.88
8202	Receiver RF-B Temp	-	°C	27.98	28.22	**	**	**	**	17.39	17.47
8203	D MOD A Temp	-	°C	25.41	25.73	37.98	37.31	36.87	36.57	36.34	36.40
8204	D MOD B Temp	-	°C	35.03	35.61	26.12	25.27	24.89	24.35	24.04	24.10
8205	Receiver A AGC	Receiver A ON	DBM	**	**	-96.77	-85.62	-89.11	-94.50	-94.97	-95.73
8206	Receiver B AGC	Receiver B ON	DBM	-94.74	-84.67	**	**	**	**	**	**
8207	Amp. A Output	Receiver A ON	TMV	**	**	2.31	2.94	2.81	2.47	2.46	2.46
8208	Amp. B Output	Receiver B ON	TMV	2.81	3.22	**	**	**	**	**	**
8209	Freq. Shift Key A OUT	Receiver A ON	TMV	**	**	1.10	1.11	1.10	1.10	1.10	1.10
8210	Freq. Shift Key B OUT	Receiver B ON	TMV	1.10	1.11	**	**	**	**	**	**
8211	Amp. A Output	Receiver A ON	TMV	**	**	1.10	1.10	1.11	1.11	1.11	1.10
8212	Amp. B Output	Receiver B ON	TMV	1.13	1.13	**	**	**	**	**	**
8215	D MOD A -15 V	Receiver A ON	TMV	**	**	5.00	5.00	5.00	4.99	4.99	4.99
8216	D MOD B -15 V	Receiver B ON	TMV	5.00	5.00	**	**	**	**	**	**
8217	Regulator A -10 V	Receiver A ON	TMV	**	**	5.40	5.39	5.39	5.38	5.38	5.38
8218	Regulator B -10 V	Receiver B ON	TMV	5.50	5.50	**	**	**	**	**	**

**Units not in use

SECTION 6

TELEMETRY SUBSYSTEM (TLM)

The Telemetry Subsystem has performed nominally during the four years in orbit except for the failure of a four-function integrated circuit chip. Functions 1011, 6012, 7010 and 12238 remain inoperative. Table 6-1 shows typical telemetry values since launch.

Landsat-1 used memory section 0 0 until Orbit 12,565, after which it was reprogrammed (Memory Section 1 1) to be more compatible with Landsat-2 telemetry matrix. Memory section 1 1 continues to be used in the telemetry matrix.

Table 6-1. TLM Telemetry Summary

Function No.	Function Name	Unit	Orbit							
			35	5099	10592	15233	17824	19514	19946	20364
9001	Memory Sequencer A Converter	VDC	6.35	6.33	6.33	6.33	6.33	6.33	6.33	6.33
9002	Memory Sequencer B Converter	VDC	**	**	**	**	**	**	**	**
9003	Memory Sequencer Temp	°C	19.59	21.06	21.30	21.94	22.97	20.52	20.17	20.78
9004	Formatter A Converter	VDC	5.99	5.99	5.99	5.99	6.02	5.99	5.99	5.99
9005	Formatter B Converter	VDC	**	**	**	**	**	**	**	**
9006	Dig. Mux A Converter	VDC	10.01	10.04	10.07	10.07	10.07	10.07	10.07	10.07
9007	Dig. Mux B Converter	VDC	**	**	**	**	**	**	**	**
9008	Formatter/Dig. Mux Temp	°C	22.50	24.89	25.00	23.55	32.03	25.00	24.99	25.00
9009	Analog Mux A Converter	VDC	26.01	21.18	26.20	26.32	26.35	26.35	26.35	26.35
9010	Analog Mux B Converter	VDC	**	**	**	**	**	**	**	**
9011	A/D Converter A Voltage	VDC	10.00	10.07	10.07	10.07	10.07	10.07	10.06	10.07
9012	A/D Converter B Voltage	VDC	**	**	**	**	**	**	**	**
9013	Analog Mux A/D Converter Temp	°C	25.00	26.83	27.49	25.63	29.10	25.32	25.00	26.56
9014	Preregulator A Voltage	VDC	19.93	19.95	19.94	19.98	19.99	19.90	19.90	19.90
9015	Preregulator B Voltage	VDC	**	**	**	**	**	**	**	**
9016	Reprogrammer Temp	°C	22.00	22.50	22.53	22.50	27.41	22.50	21.93	22.50
9017	Memory A Converter	VDC	6.00	5.99	6.00	5.97	6.00	5.97	5.97	5.97
9018	Memory A Temp	°C	17.51	17.50	17.50	17.50	17.59	17.39	17.10	17.47
9019	Memory B Converter	VDC	**	**	**	**	**	**	**	**
9020	Memory B Temp	°C	17.68	17.63	17.51	17.50	18.30	16.61	16.18	16.93
9100	Reflected Power (Xmtr A)	dBm	11.95	12.32	12.38	11.37	13.10	11.52	11.35	11.45
9101	Xmtr A -20 VDC	VDC	-19.75	-19.76	-19.75	-19.84	-19.82	-19.75	-19.75	-19.75
9102	Xmtr B -20 VDC	VDC	**	**	**	**	**	**	**	**
9103	Xmtr A Temp	°C	20.95	21.14	22.01	21.98	31.92	22.36	22.19	23.02
9104	Xmtr B Temp	°C	21.69	21.95	22.76	22.91	33.54	23.14	22.95	23.92
9105	Xmtr A Power Output	dBm	25.12	25.35	25.24	25.00	25.00	24.69	24.61	24.57
9106	Xmtr B Power Output	dBm	**	**	**	**	**	**	**	**

** Units not used since prelaunch

SECTION 7

ORBIT ADJUST SUBSYSTEM (OAS)

The Orbit Adjust Subsystem has been fired thirteen times, seven times using the -X thruster and six times using the +X thruster. Three -X firings were for initial orbit correction and four -X for orbit maintenance. The six +X firings were for orbit maintenance.

Two orbit adjusts for orbit maintenance were performed during this quarter and the OAS functioned normally in both instances.

The burns occurred during Orbits 19747 (8 June 1976) and 19871 (17 June 1976). Each burn had a 2.4 second duration and each utilized the +X thruster.

Since the burn durations were short and freon is in limited supply, the orbit adjusts were performed with the ACS in the normal mode with penumatics disabled.

Spacecraft attitude remained stable during these maneuvers via flywheel response.

The subsystem pressure/temperature parameters continue to be normal. There are 64.83 pounds of hydrazine fuel remaining from an initial pre-launch load of 67.00 pounds. Figure 2-1 shows spacecraft ground track drift from standard orbit tracks and the effects of orbit adjustment. Table 7-1 is a summary of OAS performance to date, and Table 7-2 gives average telemetry values for the off quiescent state. The -Y thrust chamber of the OAS experienced increased temperatures during January and February of this year (see Orbit 17854 in Table 7-2), due to high sun angle and sun intensity. However, towards the end of this report period, the temperature has abated considerably with decreasing sun angle and sun intensity. All temperatures are in acceptable limits.

Table 7-1. Landsat-1 Orbit Adjust Summary

Orbit	Orbit Adjust No.	Ignition Epoch	Burn Duration (Seconds)	$+\Delta a$ (Meters)	Engine Performance Efficiency	Fuel[1] Used (Lbs)	Tank Pressure (PSIA)	Tank Temperature (^{o}F)	Axis Thruster
38	1.	26 Jul 72 11:25:0.0	4.8	12	60 %		540	75	-X
44	2.	26 Jul 72 21:44:46	250.0	1975	103.4%	2.15	U[2]	U[2]	-X
59	3.	27 Jul 72 23:34:45	318.0	2391	101.5%		516	73.9	-X
938	4.	29 Sep 72 00:30:00	12.8	98	110.0 %	0.039	U[2]	U[2]	-X
2316	5.	13 Jan 73 00:21:30	20.4	154	106.0 %	0.071	489.4	75.4	-X
6390	6.	25 Oct 73 00:04:10.8	14.8	110	100.0 %	0.048	486.8	73.9	-X
7826	7.	4 Feb 74 23:27:10.4	14.7	112	101.8 %	0.048	490.59	75.4	-X
11367	8.	16 Oct 74 22:42:10.8	8.0	-65	106.0 %	0.026	490.59	74.0	+X
11464	9.	23 Oct 74 21:40:00.4	8.4	-66	102.0 %	0.027	490.58	73.9	+X
13611	10.	26 Mar 75 19:39:00.8	2.8	-22.6	101.8%	0.01	490.09	72.5	+X
14365	11.	19 May 1975 21:19:00.8	1.6	-13	102.4 %	0.01	486.84	71.6	+X
19747	12	8 June 76 19:56:00.4	2.4	-19.3	102.1%	0.01	490.59	70.1	+X
19871	13	17 June 76 17:22:00.4	2.4	-19.9	105.8%	0.01	486.84	69.4	+X

1 Initial Fuel Capacity - 67 lbs.
2 Unavailable

Table 7-2. Landsat-1 OAS Telemetry Values

Function No.	Name	Units	Orbit							
			35	5099	10182	15254	17854	19514	19946	20364
2001	Prop. Tank Temp.	^{o}C	22.03	22.86	23.28	21.62	24.07	21.20	20.78	21.20
2003	Thrust Chamber No. 1 (-x) Temp. **	^{o}C	29.57	29.93	30.55	30.52	26.52	29.93	29.21	27.32
2004	Thrust Chamber No. 2 (+x) Temp. **	^{o}C	38.76	40.28	38.91	36.25	35.93	35.70	36.08	35.20
2005	Thrust Chamber No. 3 (-y) Temp. **	^{o}C	34.55	34.41	36.09	38.45	57.50	41.65	40.99	43.88
2006	Line Pressure	psia	539.29	486.87	490.61	486.87	494.55	490.45	486.90	489.66

** Wide spread of temperature is due to nozzle locations and satellite day/night transitions relative to data averaged. Typical orbital range is from 19 to 59 DGC.

SECTION 8

MAGNETIC MOMENT COMPENSATION ASSEMBLY (MMCA)

From launch through Orbit 20370 (23 July 1976) Landsat-1's MMCA has been energized eleven times in seven orbits, i.e., Orbits 73, 85, 110, 220, 11181, 11185* and 11186*. The MMCA was operated in the early orbits to reduce +Roll pneumatic gating. (*Energized 3 times in one orbit)

In Orbits 11181 and 11186, it was energized in the plus and minus Yaw dipole configuration respectively in order to save freon gas by reducing the amplitude of the Pitch flywheel orbit frequency oscillation. In a short successful test during Orbit 11185 the plus Roll dipole was temporarily energized to determine if a positive roll dipole at the poles could unload the pitch flywheel. Upon test completion the Roll dipole was returned to 500 pole-cm.

No dipole adjustments were made during this report period.

The current dipole values are:

Pitch	+2950 Pole-Cm
Roll	-500 Pole-Cm
Yaw	-3600 Pole-Cm

Telemetry Measurement shown in Table 8-1 shows that the dipoles are holding steady without drift.

Table 8-1. MMCA Telemetry Summary (Landsat-1)

Number	Name	Units	Orbits							
			35	5099	10182	15254	17854	19514	19946	20364
4001	A1 Board Temp	^{o}C	19.77	19.03	19.11	17.59	17.59	16.80	16.56	16.69
4002	A2 Board Temp	^{o}C	23.58	23.05	23.13	21.83	21.79	21.18	21.02	21.05
4003	Hall Current	TMV	3.48	3.48	3.48	3.47	3.47	3.47	3.47	3.48
4004	Yaw Flux Density	TMV	3.11	3.11	3.15	4.02	4.03	4.03	4.03	4.03
4005	Pitch Flux Density	TMV	3.13	2.51	2.52	2.52	2.52	2.52	2.52	2.52
4006	Roll Flux Density	TMV	3.19	3.19	3.20	3.28	3.28	3.28	3.28	3.28

SECTION 9

UNIFIED S-BAND/PREMODULATION PROCESSOR (USB/PMP)

The USB subsystem performed all functions nominally during its four years in orbit. The only abnormality occurred in Transmitter A. After about two months in orbit, the transmitter output suddenly lost about 19% of its power. In a series of such power stepdowns over the next 7 months, the power output dropped to about 0.25 Watts, 16% of its original power. In the next 15 months, two years after launch, power dropped to 0.14 Watts where it was only marginally able to perform its functions. At that time, the redundant transmitter, B, was substituted. Full power of about 1.5 Watts was restored and it has remained at that level for the remaining two years.

Switching transmitters automatically switches receivers, so that all components of the subsystem have been used except the redundant portions (descriminator, and oscillator/Modulator) of the PMP Modulator.

Table 9-1 shows telemetry values since launch. All are nominal.

Figure 9-1 shows the USB power output history since launch. In Orbit 10068, the B Section of the transmitter was substituted, restoring full power output to the System. Figure 9-2 shows AGC readings at Goldstone for a constant reference orbit in each cycle since launch. The scatter of data points reflect variations in the ground station calibration and readout.

Table 9-1. Landsat-1 USB/PMP Telemetry Values

Functions			Orbit							
No.	Name	Units	35	5099	10592	15233	17824	19514	19946	20364
11001	USB Rcvr AGC	DBM	-122.78	-131.99	-129.81	-105.41	-114.78	-129.19	-130.30	-132.00
11002	USB Xmtr Pwr	WTS	1.60	0.29	1.54	1.53	1.55	1.58	1.56	1.55
11003	USB Rcvr Error	KHZ	21.79	-21.32	-23.25	-18.01	- 17.52	-22.62	-22.16	-21.76
11004	USB Xpond Temp	DGC	22.92	22.64	25.64	25.11	32.19	25.16	24.88	25.37
11005	USB Xpond Press	PSI	15.91	15.91	15.92	15.94	16.34	15.90	15.89	15.90
11007	USB Xmtr A -15V	VDC	-15.20	-15.20	**	**	**	**	**	**
11008	USB Xmtr B -15V	VDC	**	**	-15.20	-14.96	-15.20	-15.04	-15.20	-15.20
11009	USB Range -15V	VDC	-14.76	-14.76	-14.58	-14.58	-14.58	-14.58	-14.58	-14.58
11101	PMP Pwr A Volt	VDC	-15.12	-15.18	**	**	**	**	**	**
11102	PMP Pwr B Volt	VDC	**	**	-15.12	-14.82	-14.81	-15.11	-15.12	-15.13
11103	PMP Temp A	DGC	30.44	30.23	26.60	26.09	36.90	25.78	25.32	26.62
11104	PMP Temp B	DGC	**	**	31.64	31.67	42.29	30.37	30.01	31.12

** Units Not in Use

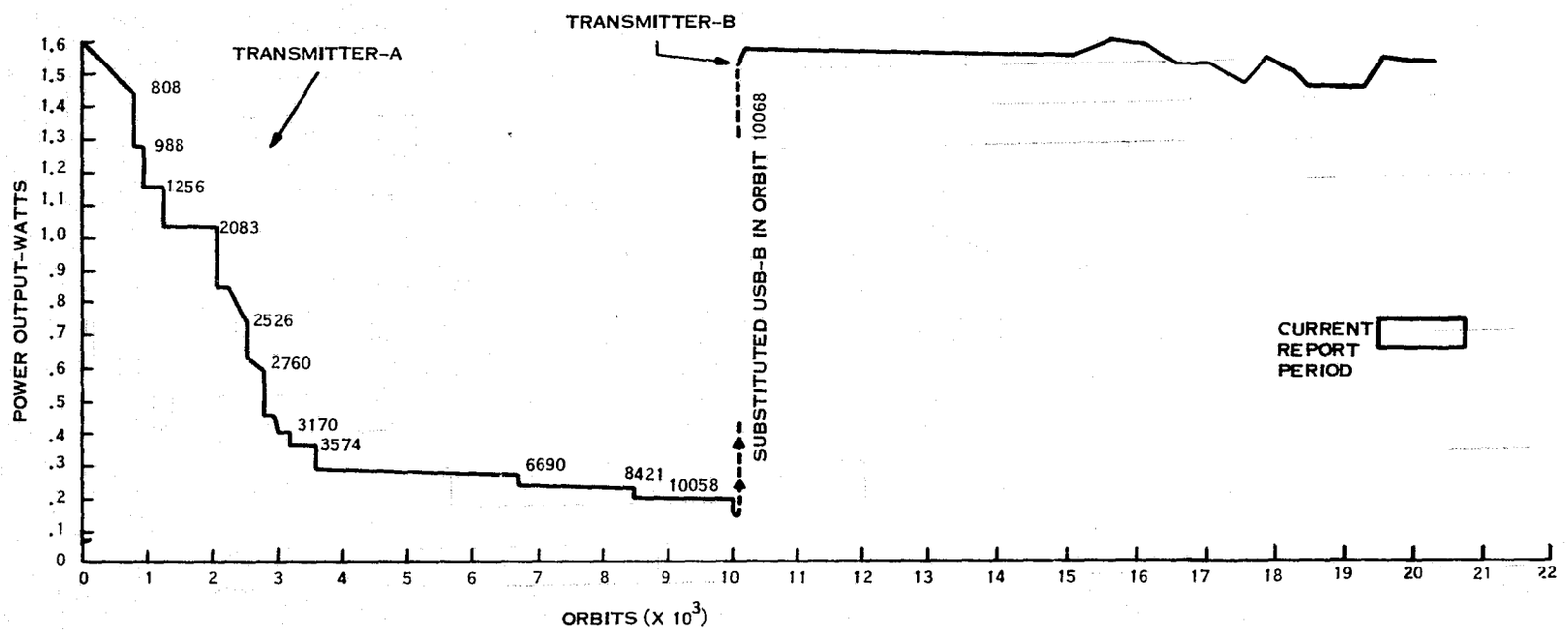


Figure 9-1. USB Power Output History (Landsat-1)

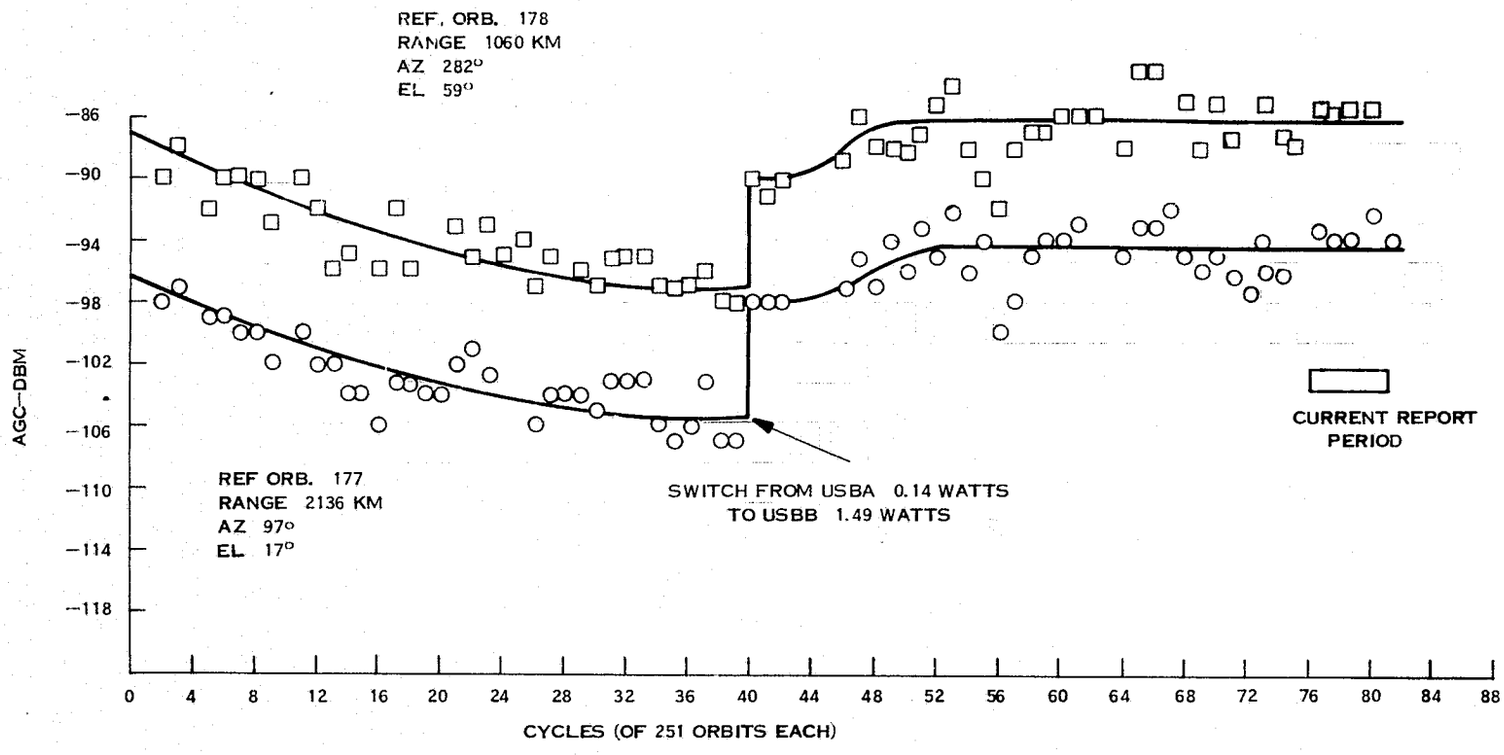


Figure 9-2. USB (Link 4) AGC Readings at Goldstone with 30' Antenna (Landsat-1)

SECTION 10

ELECTRICAL INTERFACE SUBSYSTEM (EIS)

Auxiliary Processing Unit (APU) consisting of Search Track Data, Time Code Data, and Backup Timers, operated satisfactorily throughout this report period. Telemetry for the APU is shown in Table 10-1. The APU is in Normal mode.

Table 10-1. Landsat-1 APU Telemetry Functions

			Orbit							
Functions	Description	Unit	7	5098	10182	15254	17854	19514	19946	20364
13200	APU, -24.5 VDC	VDC	-24.90	-24.90	-24.91	-24.90	-24.90	-24.90	-24.89	-24.90
13201	APU, -12 Volts	VDC	-12.08	-12.08	-12.07	-12.06	-12.06	-12.05	-12.04	-12.05
13202	APU Temp.	DGC	25.49	26.95	27.15	26.82	31.49	27.28	26.92	27.31

The Power Switching Module (PSM), containing the switching relays for power to Orbit Adjust, MSS, WBVTR No. 1 and No. 2., RBV and PRM, functioned normally. The MSS power circuits have been operating on a regular basis throughout this report period. The power relay for the RBV remained in a failed closed condition since Orbit 196.

The Interface Switching Module (ISM) performed all switching normally during this report period.

The spacecraft regulators switching circuits were exercised when an unencoded command (stimulated by RF noise) caused the spacecraft regulator to switch from Space Regulator 2 to Spacecraft Regulator 1 in Orbit 20113 on 29 June 1976.

SECTION 11

THERMAL SUBSYSTEM (THM)

The Thermal Subsystem in Landsat-1 has completed four years of successful temperature control of all spacecraft equipment. The minor anomalies in the subsystem were mainly associated with telemetry and have not affected the spacecraft mission.

Since the time of launch, the right sun sensor on Landsat-1 has registered temperatures higher than expected. However, this has been determined to be justifiable for the particular location and bonding techniques used for the sensor. During Orbit 4396 (3 June 1973) telemetry function 7101 (THM TH07 STI) became disabled when four telemetry gates mounted on one integrated circuit chip failed.

During each year in the past, Landsat-1 has experienced a period of high temperatures brought about by a combination of adverse peaks of high sun intensity, sun angle and longer satellite days. The cyclically varying sun angle and length of satellite day reaches higher and higher peaks in successive years due to the drift in the satellite's orbital plane. Thus, during February 1976, Landsat-1 experienced the highest temperatures to date. The increase in temperature was must noticeable along bays 11 through 17, which are normally warmer than others. The temperature spread between batteries increased to more than 15°C with battery 5 in bay 14 registering temperatures as high as 34.7°C. Although the spacecraft mission was unaffected, the high temperature environment affected the response of the sensor potentiometer for shutter 14 position telemetry (FUNC 7072). However, the response became normal when the temperatures dropped to a lower range. During February 1977, the spacecraft will experience still higher sun angles and longer satellite days, resulting in even higher spacecraft temperatures.

Table 11-1 shows average analog telemetry values from data recorded on the NBR, for selected orbits since launch.

The compensation load configuration on Landsat-1 has been switched several times to get even temperatures among spacecraft components. A history of compensation load switching is given in Table 11-2.

During this report period the sun intensity ranged between 0.989 and 0.967 of the mean value and the spacecraft temperatures remained in the normal range. (See Orbits 19514, 19946 and 20364 in Table 11-1.) The temperatures are expected to increase in the on-coming period of higher sun intensity. Figure 11-1 shows a typical thermal profile for average bay temperatures of the sensory ring at the end of this report period.

FOLDOUT FRAME

Table 11-1. Landsat-1 Thermal Subsystem Analog Telemetry (Average Value of Frames for Data Received in NBTR Playback)

Function		Unit	Orbits							
No.	Description		26	5098	10182	15254	17854	19514	19946	20364
7001	THM TH01 ST1	DGC	19.52	20.85	21.65	19.48	20.53	18.55	18.32	18.72
7002	THM TH02 SBO	DGC	18.60	19.95	20.60	18.62	18.52	17.90	17.78	17.87
7003	THM TH03 STI	DGC	18.48	20.16	20.87	18.11	18.30	17.16	16.96	17.20
7004	THM TH10 TCB	DGC	19.47	20.25	20.36	19.76	22.35	19.92	19.62	19.75
7005	THM TH04 STI	DGC	18.39	19.71	20.35	17.86	17.91	17.06	16.92	17.08
7006	THM TH05 SBO	DGC	17.57	18.39	18.81	17.20	16.78	16.49	16.34	16.47
7007	OA-X THRUSTER	DGC	21.95	22.95	22.90	22.25	21.98	21.92	21.65	21.33
7008	THM TH06 STO	DGC	15.95	16.61	16.90	15.34	14.92	14.56	14.41	14.52
7009	THM TH06 SBI	DGC	19.38	20.35	20.93	18.98	18.52	17.99	17.74	17.86
7010	THM TH07 STI	DGC	18.61	*	*	*	**	**	**	**
7011	THM TH08 STO	DGC	21.78	22.77	22.88	22.03	21.65	21.62	21.40	21.17
7012	THM TH09 SBI	DGC	21.81	22.87	23.08	22.20	22.97	21.98	21.71	21.66
7013	THM TH10 SBO	DGC	18.73	19.53	19.64	19.00	20.07	18.88	18.60	18.56
7014	THM TH11 STI	DGC	22.37	23.35	23.57	22.80	26.10	22.94	22.62	22.88
7015	THM TH12 SBO	DGC	22.37	23.17	23.03	22.86	28.89	23.52	23.17	23.71
7016	THM TH13 STI	DGC	20.95	22.02	22.47	22.00	28.77	22.47	22.10	22.89
7017	RBV BEAM CTR LN	DGC	21.53	22.62	22.84	21.88	23.87	21.83	21.53	21.63
7018	THM TH14 STO	DGC	20.38	21.40	21.93	21.83	30.96	22.36	22.04	23.19
7019	NBR RAD OUTBD B4	DGC	5.09	5.86	6.00	4.37	4.37	3.34	3.20	3.31
7020	THM TH15 SBI	DGC	21.14	23.24	23.99	22.18	29.63	22.36	21.97	23.06
7021	THM TH16 STI	DGC	20.73	22.90	23.68	21.64	26.82	21.17	20.77	21.68
7022	THM TH17 SBI	DGC	20.22	22.76	23.56	21.47	24.88	20.33	19.93	20.83
7023	THM TH18 SBO	DGC	21.90	24.29	25.19	23.47	25.44	22.12	21.85	22.56
7030	THM TH03 BUR	DGC	16.05	17.07	17.42	15.35	15.09	14.73	14.63	14.62
7031	THM TH06 BUR	DGC	13.59	14.17	14.28	12.87	12.40	12.18	12.01	12.07
7032	THM TH09 BUR	DGC	19.92	20.75	20.74	20.17	20.56	20.02	19.78	19.64
7033	THM TH12 BUR	DGC	21.51	22.16	22.76	22.65	29.42	23.40	23.05	23.67
7034	THM TH15 BUR	DGC	19.70	21.67	22.38	21.33	28.86	21.54	21.22	22.23
7035	THM TH18 BUR	DGC	20.11	21.36	22.02	20.54	22.17	19.83	19.66	20.07
7040	THM TH01 TCB	DGC	19.27	20.46	21.26	19.19	19.94	18.45	18.28	18.59
7041	THM TH02 TCB	DGC	17.99	19.23	19.89	17.80	17.70	17.10	16.95	17.11
7042	THM TH03 TCB	DGC	18.34	19.94	20.92	17.79	17.64	17.19	17.04	17.16
7043	THM TH04 TCB	DGC	18.95	19.94	20.26	18.60	18.44	18.04	17.91	18.00
7044	THM TH05 TCB	DGC	16.27	16.98	17.32	15.90	15.57	15.21	15.03	15.22
7045	THM TH07 TCB	DGC	18.41	19.21	19.45	18.25	18.01	17.69	17.46	17.46
7046	THM TH09 TCB	DGC	19.38	20.37	20.64	19.85	20.13	19.50	19.18	19.17
7048	THM TH11 TCB	DGC	21.98	22.94	23.18	22.80	26.85	23.19	22.86	23.18
7049	THM TH12 TCB	DGC	21.92	22.46	22.35	22.30	29.54	23.01	22.67	23.35
7050	THM TH13 TCB	DGC	21.21	21.99	22.29	22.26	31.21	22.95	22.61	23.62
7051	THM TH14 TCB	DGC	21.38	22.88	23.62	22.74	31.57	23.02	22.55	23.83
7052	THM TH16 TCB	DGC	21.30	23.95	25.13	22.68	28.17	22.41	22.02	23.00
7053	THM TH17 TCB	DGC	21.73	24.03	25.02	23.33	25.17	21.44	21.14	21.89
7054	THM TH18 TCB	DGC	20.02	22.20	23.35	21.04	21.79	19.84	19.52	20.10
7060	THM SHUTTER BY 1	DEG	25.85	33.12	38.62	24.41	31.45	17.87	16.26	19.19
7061	THM SHUTTER BY 2	DEG	6.62	8.65	13.28	1.73	1.17	0.00	0.00	0.00
7062	THM SHUTTER BY 3	DEG	10.96	23.58	30.24	17.20	13.62	12.87	12.19	12.11

7050	THM TH13 TCB	DGC	21.21	21.99	22.29	22.26	31.21	22.95	22.61	23.62
7051	THM TH14 TCB	DGC	21.38	22.88	23.62	22.74	31.57	23.02	22.55	23.83
7052	THM TH16 TCB	DGC	21.30	23.95	25.13	22.68	28.17	22.41	22.02	23.00
7053	THM TH17 TCB	DGC	21.73	24.03	25.02	23.33	25.17	21.44	21.14	21.89
7054	THM TH18 TCB	DGC	20.02	22.20	23.35	21.04	21.79	19.84	19.52	20.10
7060	THM SHUTTER BY 1	DEG	25.85	33.12	38.62	24.41	31.45	17.87	16.26	19.19
7061	THM SHUTTER BY 2	DEG	6.62	8.65	13.28	1.73	1.17	0.00	0.00	0.00
7062	THM SHUTTER BY 3	DEG	10.96	23.58	30.24	17.30	13.62	12.37	12.19	12.44
7063	THM SHUTTER BY 4	DEG	30.60	35.71	37.92	29.50	27.75	25.28	24.20	25.00
7064	THM SHUTTER BY 5	DEG	15.03	16.25	15.00	8.08	5.19	4.62	4.62	4.62
7065	THM SHUTTER BY 7	DEG	17.14	24.64	21.96	14.50	9.00	8.00	8.00	8.00
7067	THM SHUTTER BY 9	DEG	33.26	38.44	39.50	38.24	38.83	37.97	37.50	37.50
7068	THM SHUTTER BY 10	DEG	24.68	28.68	27.31	26.03	40.69	24.26	24.26	24.26
7069	THM SHUTTER BY 11	DEG	39.66	46.89	48.96	46.97	62.45	48.59	46.17	48.40
7070	THM SHUTTER BY 12	DEG	43.81	46.63	45.68	45.95	70.31	50.46	48.21	52.19
7071	THM SHUTTER BY 13	DEG	40.39	46.38	44.79	42.84	62.63	43.37	42.46	44.43
7072	THM SHUTTER BY 14	DEG	34.20	39.70	41.91	34.28	58.50	33.91	33.07	34.65
7073	THM SHUTTER BY 15	DEG	45.40	58.74	64.79	55.15	82.15	59.27	55.76	63.60
7074	THM SHUTTER BY 16	DEG	24.50	48.46	53.54	38.76	64.40	36.46	33.28	40.06
7075	THM SHUTTER BY 17	DEG	39.06	54.96	61.88	51.06	63.68	36.85	34.14	39.95
7076	THM SHUTTER BY 18	DEG	29.70	43.15	51.20	35.12	40.95	25.87	22.56	28.09
7080	THM Q1 T ZENER V	VDC	8.19	8.19	8.19	8.19	8.19	8.19	8.19	8.19
7081	THM Q2 T ZENER V	VDC	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40
7082	THM Q3 T ZENER V	VDC	8.31	8.31	8.32	8.31	8.31	8.31	8.31	8.31
7083	THM Q1 S ZENER V	VDC	8.31	8.32	8.35	8.31	8.35	8.31	8.31	8.31
7084	THM Q2 S ZENER V	VDC	8.19	8.19	8.20	8.19	8.20	8.19	8.19	8.19
7085	THM Q3 S ZENER V	VDC	8.15	8.15	8.15	8.15	8.15	8.15	8.15	8.15
7090	THM PSM MOUNT	DGC	21.60	22.54	22.98	21.43	24.02	20.95	20.61	20.98
7091	THM IND ATTITUDE	DGC	19.40	20.42	20.88	19.13	19.16	18.36	18.13	18.23
7092	THM RBV RADIATOR	DGC	15.65	17.22	17.47	16.55	18.68	16.72	16.43	16.52
7093	THM RBVC CTR BM	DGC	20.30	21.61	21.87	20.73	23.24	20.78	20.46	20.69
7094	THM WBVTR ROOT	DGC	12.96	15.71	16.07	13.77	14.42	11.80	11.65	12.00
7095	THM WBVTR RAD CT	DGC	4.81	8.17	8.68	6.99	7.56	5.88	5.88	5.99
7096	THM WBVTR STRAP	DGC	16.62	19.32	19.66	17.29	17.07	14.52	14.33	14.72
7097	THM WB MT BAY 1	DGC	20.56	19.52	21.37	16.97	18.23	16.40	16.14	16.35
7098	THM WB MAT BAY 1	DGC	20.22	18.90	20.39	17.12	18.89	16.61	16.35	16.65
7099	THM WBVTR SEP 3	DGC	18.60	20.55	21.05	18.45	18.49	17.02	16.78	17.09
7100	THM WBVTR SEP 17	DGC	21.31	23.66	24.23	22.02	24.61	20.55	20.19	20.96
7101	THM WBVTR 1 CENT	DGC	21.49	23.72	24.01	21.63	20.67	17.99	17.72	18.23
7102	THM WBVTR 2 BAY	DGC	17.46	18.92	19.32	17.23	17.55	16.27	16.07	16.31
7103	THM WBVTR 2 BY 15	DGC	21.00	23.16	23.82	21.73	26.34	20.84	20.47	21.33
7104	THM WBVTR 2 CTR	DGC	19.35	21.51	21.81	19.54	20.59	17.30	17.01	17.53
7105	THM NBTR B SEP 6	DGC	18.06	19.30	19.79	17.82	18.32	16.64	16.46	16.74
7106	THM NBTR B SEP 1	DGC	20.82	22.35	22.89	21.61	27.72	21.58	21.19	22.04
7107	THM NBTR BM CTR	DGC	19.37	21.04	21.34	19.51	21.93	18.74	18.43	18.94
7108	THM MSS MOUNT 14	DGC	19.18	21.15	21.70	20.06	26.45	20.15	19.79	20.70
7109	THM OA -Y THRUSTER	DGC	22.21	23.80	24.69	24.40	34.20	25.23	24.82	26.22
7110	THM MSS WBVTR BM	DGC	18.14	20.06	20.53	18.18	19.56	17.18	16.97	17.38
7111	THM OA +X THRUSTER	DGC	20.30	19.92	21.22	18.07	19.48	17.55	17.36	17.57
7130	THM AUX P1 T	DGC	15.69	8.49	-18.90	9.68	21.76	9.25	9.67	10.29
7131	THM AUX P2 T	DGC	10.63	1.59	.41	5.64	23.25	25.57	16.82	25.81

*Function 7010 became invalid after an integrated circuit chip failure in the TMP on Orbit 4396.

FOLDOUT FRAME 2

LS-1

11-3/4

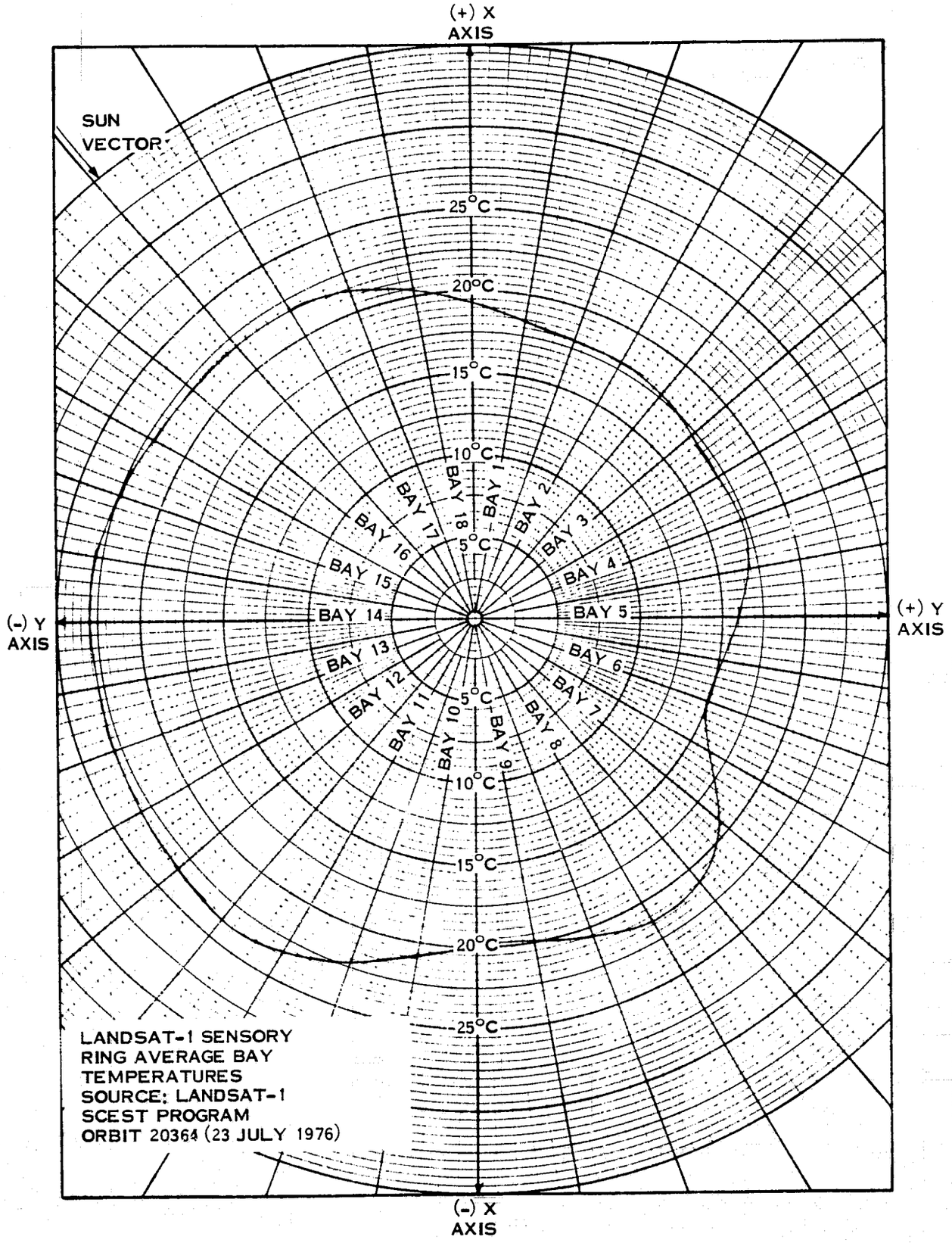


Figure 11-1. Sensor Ring Thermal Profile

Table 11-2. Landsat-1 Compensation Load History

Orbits	Compensation Load Status*							
	1	2	3	4	5	6	7	8
Launch	0	0	0	0	0	0	0	0
2	0	0	X	X	X	0	X	X
6	X	X	X	X	X	0	X	X
118	0	0	0	0	0	0	0	0
156	X	X	X	X	X	0	X	X
194	0	0	0	0	0	0	0	0
197	X	X	X	X	X	0	X	X
701	X	X	0	X	X	0	X	X
1410	X	X	0	X	X	0	0	X
3484	X	X	X	X	X	0	0	X
3641	X	X	0	X	X	0	0	X
3646	X	X	X	X	X	0	0	X
4177	X	X	0	X	X	0	0	X
6872	X	X	X	X	X	0	0	X
6966	X	X	0	X	X	0	0	X
8291	X	X	X	X	X	0	0	X
8348	X	X	0	X	X	0	0	X
8449	X	X	X	X	X	0	0	X
8472	X	X	0	X	X	0	0	X
8538	X	X	X	X	X	0	0	X
8928	X	X	0	X	X	0	0	X
9898	X	X	X	X	X	0	0	X
10410	X	X	0	X	X	0	0	X
11125	0	0	0	0	0	0	0	0
11126	X	X	0	X	X	0	0	X
11127	0	0	0	0	0	0	0	0
11133	X	X	0	X	X	0	0	X
12604	X	X	X	X	X	0	0	X
13206	X	X	0	X	X	0	0	0
15584	X	X	0	0	X	0	0	0

* Note: X = ON
0 = OFF

SECTION 12

NARROW BAND TAPE RECORDERS (NBR)

The NBR subsystem provided excellent service until Narrowband Recorder-B was turned off in Orbit 15256 when an apparent clutch failure resulted in tape stoppage. This was attributed to normal wear of component. With a design goal of one year, NBTR-B operated normally for three years, NBTR-B has remained inactive since then.

Narrowband Recorder-A operated satisfactorily during this period, and has provided coverage for MSS real-time operations as well as approximately 3-1/2 hours daily of normal orbital telemetry recording and playback functions. Continuous NBR coverage is not being provided in order to conserve the remaining NBR life.

Table 12-1 gives cumulative operating hours for both recorders by modes, and Table 12-2 gives typical telemetry values.

Table 12-1. NBR Operating Hours by Modes, Landsat-1

NBR	ON	OFF	Playback	Record
A	15408	19700	618	14790
B	11909	12666	476	11433

Table 12-2. Narrowband Tape Recorder Telemetry Values, Landsat-1

Function		Typical Telemetry Values - Orbits					
No.	Name	36/37	2111/2112	4980/4981	6751/6752	7211/7212	7631/7632
10001	A - Motor Cur. (ma)						
	Record	132.0	133.3	130.2	128.6	127.0	128.6
	P/B	108.0	95.2	93.7	92.1	88.9	90.5
10101	B - Motor Cur. (ma)						
	Record	148.5	141.7	135.7	128.1	128.1	129.6
	P/B	143.6	138.7	135.7	125.1	120.1	125.1
10002	A - Pwr Sup. Cur. (ma)						
	Record	170.5	167.5	162.5	155.9	156.0	155.9
	P/B	410.0	399.3	399.3	382.1	389.4	396.0
10102	B - Pwr Sup. Cur. (ma)						
	Record	260.0	261.3	264.5	261.3	261.3	261.4
	P/B	481.0	479.7	489.2	476.6	463.9	470.2
10003	A - Rec. Temp (DGC)	26.1	26.1	24.2	21.8	22.4	21.8
10103	B - Rec. Temp. (DGC)	27.0	27.0	26.2	22.7	24.3	25.4
10004	A - Supply (VDC)	-24.87	-25.1	-25.1	-24.8	-25.1	-25.1
10104	B - Supply (VDC)	-24.55	-24.6	-24.6	-24.6	-24.4	-24.4

SECTION 13

WIDEBAND TELEMETRY SUBSYSTEM (WBTS)

The Wideband Telemetry Subsystem has operated nominally throughout the four year period. WPA-1, normally used with RBV data, has been used only briefly because the failure of the RBV input power circuit prevented the use of that equipment after the second week in orbit. Between Orbits 1890 and 2099 WPA-1 was substituted for WPA-2 during the Apollo launch operations to transmit MSS data to avoid possible interference to the launch operation. WPA-2 and its modulator, with MSS input, have operated nominally throughout the 4-year period. Except for brief tests after launch in the 10-watt mode, both WPA's have operated in the 20-watt mode. The only subsystem component that has not been used in orbit is the redundant Modulator Power Supply (B).

Table 13-1 shows typical telemetry values. All are nominal.

Figure 13-1 is the AGC history at Goldstone. The scatter of data points reflect variations in the ground station calibration and readout. The interweaving of the data points of the two curves and the close proximity of the curves to each other is a reflection of the antenna design to deliver equal power to all ranges. The curves are separated less than 4 dB. Since one is at double the range of the other, power from an omni-directional antenna would generate curves separated by 6 dB. For comparison, the USB antenna delivers power at these ranges with a difference of 8 dB. (See Figure 9-2). It is evident, therefore, that the antenna design for the wideband power amplifier was largely successful in delivering increased power to increased ranges.

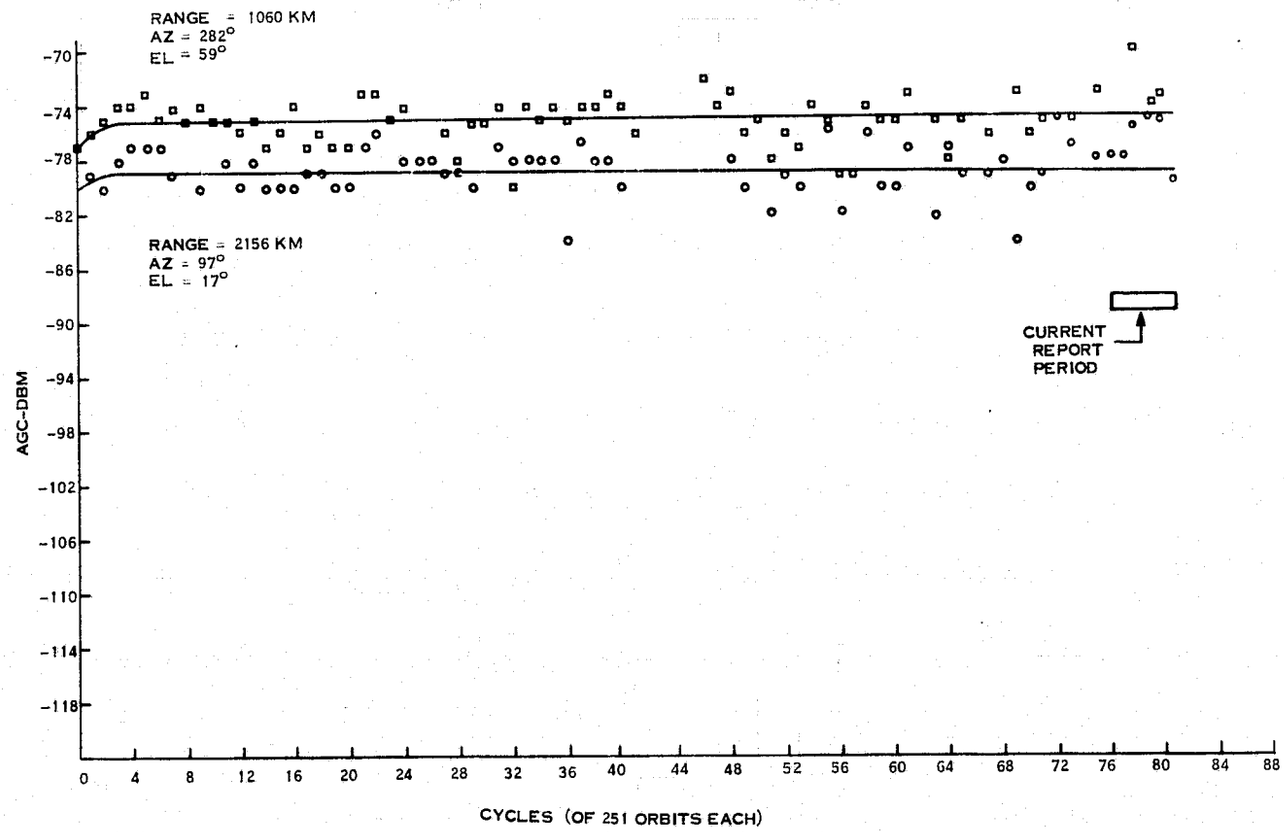


Figure 13-1. WPA-2 (Link 3) AGC Readings at Goldstone with 30' Antenna - Landsat-1

Table 13-1. Wideband Modulator Telemetry Values, Landsat-1

WBPA-1

Function			Orbits			
Number	Name		26	1894	1944	2095
12001	Tmpt TWT Coll.	(DgC)	35.7	39.20	39.90	39.90
12002	Helix Current	(Ma)	6.08	6.49	6.58	6.78
12003	TWT Cath. Curr.	(Ma)	45.89	43.54	43.48	45.01
12004	Forward Pwr	(DBM)	43.18	42.88	42.61	43.15
12005	Reflected Pwr	(DBM)	34.95	34.99	34.80	35.21
12227	Loop Str. AFC Con Volt (1)	(MHz)	-0.39	-1.29	-0.86	-0.67
12229	Mod Temp VCO	(DgC)	21.93	20.31	20.88	20.39
12232	+15 VDC Pwr Sup A (2)	(TMV)	2.69	2.69	2.65	2.62
12234	-15 VDC Pwr Sup A	(TMV)	5.98	5.96	5.73	5.78
12235	+5 VDC Pwr Sup A	(TMV)	3.94	3.94	3.94	3.95
12238	-5 VDC Pwr Sup A	(TMV)	5.28	5.26	5.18	5.12
12240	-24 VDC Unreg Volt A	(TMV)	5.56	5.51	5.42	5.49
12242	Inv. Temp	(DgC)	20.60	23.43	24.71	24.04

WBPA-2

Function			Orbits							
Number	Name		33	4096	10602	15233	17824	19567	19957	20358
12101	Temp TWT Coll. (Max)	(DgC)	35.38	34.24	35.96	29.77	23.88	29.62	29.17	33.90
12102	Helix Current	(Ma)	7.32	7.70	7.67	7.90	7.94	7.82	7.83	7.82
12103	TWT Cath. Cur.	(Ma)	44.30	43.85	42.72	43.70	42.65	42.91	42.91	42.83
12104	Forward Pwr	(DBM)	43.57	43.57	43.47	43.52	43.49	43.45	43.46	43.41
12105	Reflected Pwr	(DBM)	31.59	32.79	32.62	33.07	33.11	32.72	32.73	32.60
12228	Loop Str. AFC Con Volt (1)	(MHz)	1.11	-0.78	-1.12	-1.05	-1.17	-1.40	-1.46	-1.53
12229	Mod Temp VCO	(DgC)	21.70	20.88	21.50	21.78	20.45	21.76	21.13	23.65
12232	+15 VDC Pwr Sup A (2)	(TMV)	2.68	2.69	2.69	2.65	2.67	2.67	2.66	2.66
12234	-15 VDC Pwr Sup A	(TMV)	5.90	5.98	5.92	5.81	5.80	5.88	5.87	5.85
12236	+5 VDC Pwr Sup A	(TMV)	3.97	4.01	4.01	3.97	3.97	4.01	4.02	3.96
12239	-5 VDC Pwr Sup A	(TMV)	5.24	telemetry point defective						
12240	-24.5 VDC Unreg Volt A	(TMV)	5.43	5.52	5.46	5.44	5.47	5.42	5.45	5.37
12242	Inv. Temp	(DgC)	23.03	22.96	23.86	23.66	23.44	22.56	22.01	22.73

(1) Satisfactory if not -14.0 or +14.0. (2) B Power Supply not yet used in orbit

SECTION 14

ATTITUDE MEASUREMENT SYSTEM (AMS)

The AMS subsystem was launched in the OFF mode and energized in Orbit 6. Its performance since Orbit 6 has been without incident. Attitude measurements made with the AMS are in good agreement with ACS fine attitude error measurements.

Table 14-1 gives typical AMS telemetry values.

Table 14-1. Landsat-1 AMS Temperature Telemetry

			Orbits							
Function	Description	Units	35	5099	10182	15254	17826	19514	19946	20364
3004	Case-Temp 1	DGC	18.92	19.42	19.71	18.54	19.40	18.56	18.27	18.23
3005	Assembly-Temp 2	DGC	19.15	19.76	19.96	18.73	19.74	18.89	18.57	18.51

SECTION 15

WIDEBAND VIDEO TAPE RECORDERS (WBVTR)

WBVTR-2 has not been operated since its failure in Orbit 148.

WBVTR-1 was removed from operational service after Orbit 9881 because of high minor frame sync error counts. The recorder has remained inactive since suspension of engineering tests after Orbit 10861.

Pressure and temperature telemetry values for WBVTR-1 transport and electronics units are shown in Table 15-1.

Table 15-1. WBVTR-1 Telemetry Values

WBVTR-1 Functions		Telemetry Values in Orbits							
Number	Name	15	5029	10088	15260	17810	19514	19946	20364
13022	Press. Trans. (PSI)	16.12	16.11	15.98	15.73	15.73	15.59	15.59	15.59
13023	Temp. Trans. (DgC)	19.50	21.84	20.81	18.55	19.50	16.99	16.70	17.19
13024	Temp. Elec. (DgC)	22.78	20.44	23.72	15.00	15.38	14.55	14.29	14.23

SECTION 16

RETURN BEAM VIDICON (RBV)

During Orbit 196 (August 6, 1972) when the RBV was turned ON for a real time pass, a short to ground occurred in the Power Switching Module (PSM) between the Payload Regulated Bus and ground. When the scheduled time for turn OFF arrived, the cameras failed to turn OFF by normal means. Auxiliary means were used to disconnect the RBV. The RBV subsystem has not been used since then. RBV performance was nominal while in use.

The RBV has not been reactivated since Orbit 196, but it is capable of operation through individual component power switching. An assessment of the RBV performance was given in ERTS-1 Flight Evaluation Report 23 July to 23 October, 1972.

SECTION 17

MULTISPECTRAL SCANNER SUBSYSTEM (MSS)

The Multispectral Scanner Subsystem has operated nominally throughout the entire four years in orbit. Images have been taken of 95% of the earth's land masses with less than 30% cloud cover. Bit errors have remained in the order of 1 part per million. About 2 billion square nautical miles of the earth's surface have been imaged (which averages about 17 repetitions of all earth land masses). Cycling of equipment components has reached very high numbers; e.g., the scan mirror has cycled about 122 million times without significant change in line length or position of mid scan pulse. With the exception of Sensor 13, sensor response has gradually deterioriated at the expected rate, still well within useful range. Sensor 13 saturates before the other sensors when the scene approaches bright white, but software compensation nearly obscures this. There have been no equipment malfunctions.

The redundant portions of the subsystem power supplies have not been used operationally.

Figure 17-1 shows the number of scenes imaged at each geographical location in the first 3 years of operation. Figure 17-2 shows the number of scenes imaged since the first 3 years. Figure 17-3 shows the scenes imaged in this quarter. In these maps, only those scenes received by U. S. ground stations are shown. Scenes transmitted to Canada, Brazil and Italy (41% of total) are not shown.

Table 17-1 shows typical telemetry values since launch. All telemetry values are nominal.

Table 17-2 shows the history of sensor response to a constant input radiance level. Each sensor is sampled at 5 radiance levels, and all show essentially the same trends. Only one of these levels (the second highest) is listed in Table 17-2. Sensor 5 has declined most (22%) since launch. This is twice the average sensor decline. Sensor 13 appears to be levelling off from its earlier rising trend. It is now only 13% above its launch level.

Line length history is also shown in Table 17-2, and appears to be recovering some of its lost length.

Sun Calibrations, performed every two weeks, continue to show nominal performance.

FOLDOUT FRAME

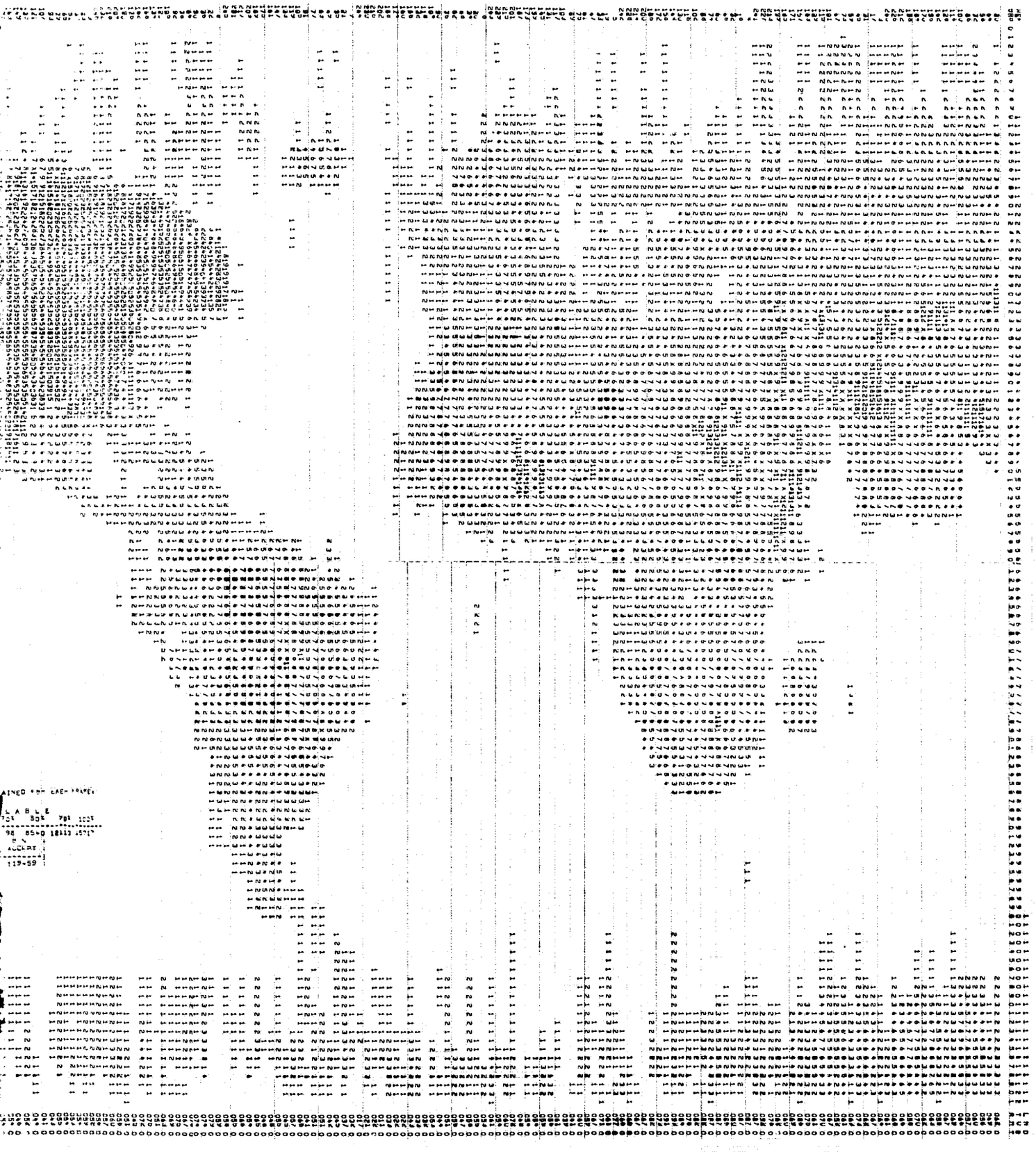
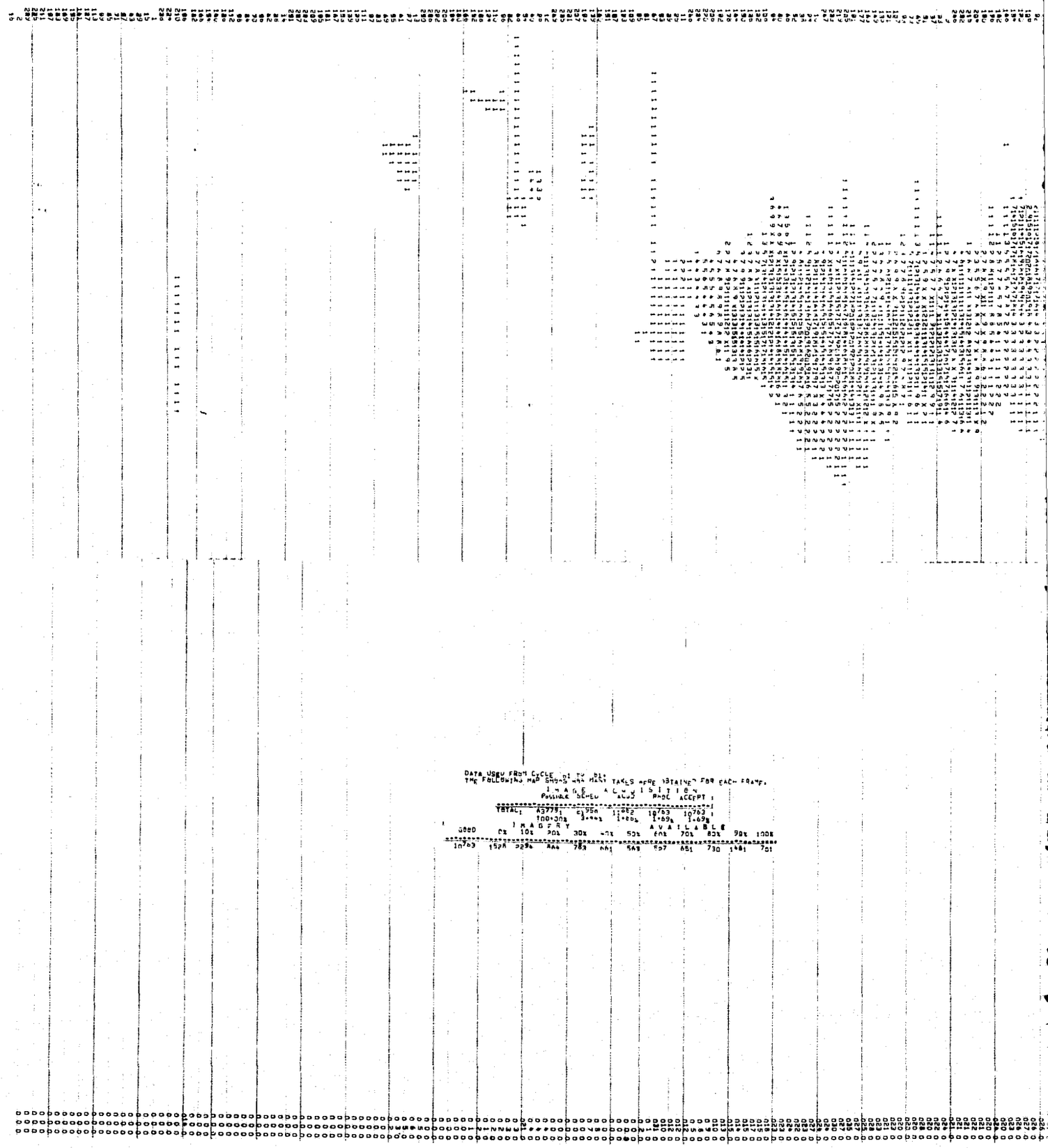


Figure 17-1. Computer Map of MSS Scenes for First Three Years Operation-Landsat 1

FOLDOUT FRAME 2



FOLDOUT FRAME

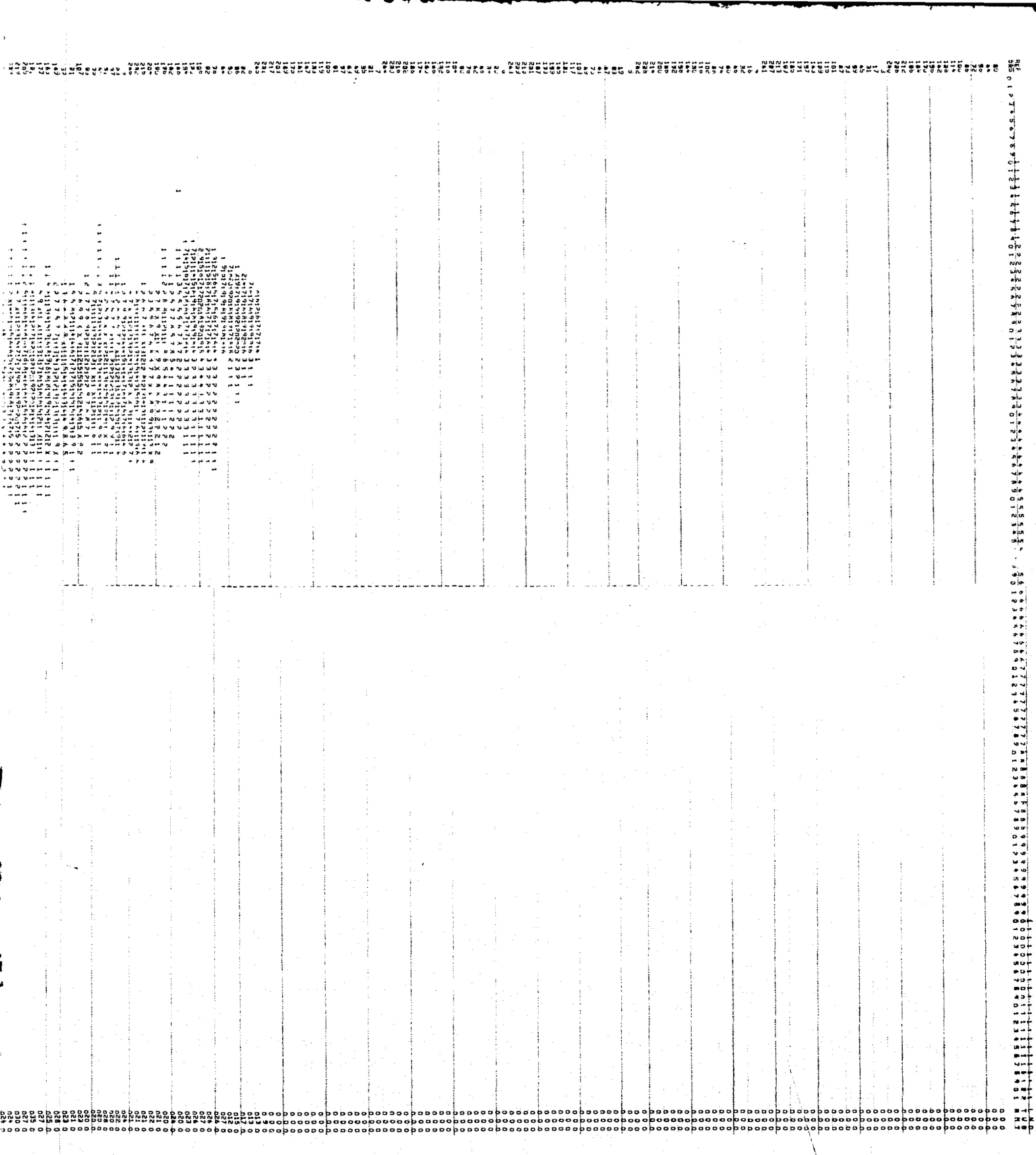
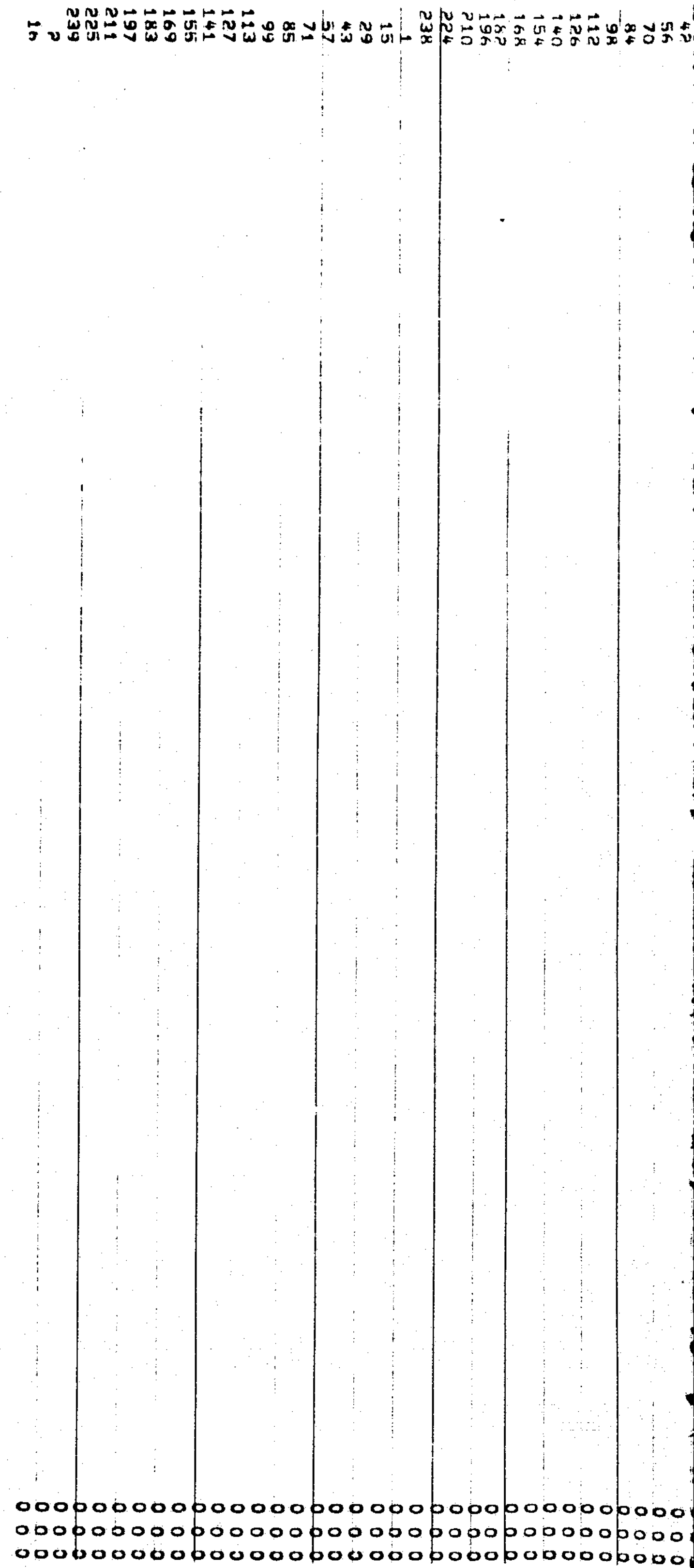
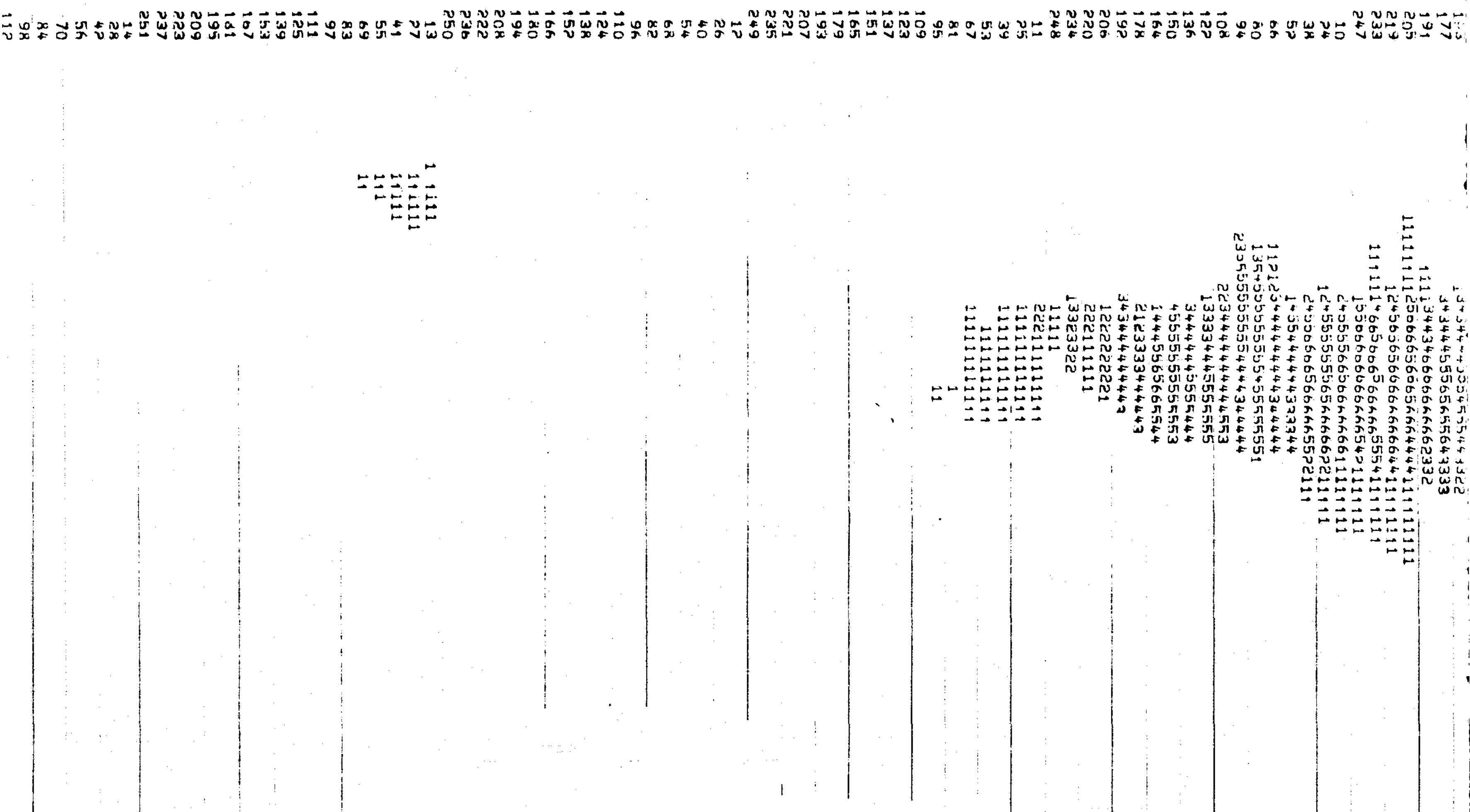


Figure 17-2. MSS Scenes Imaged in Fourth Year



FOLDOUT FRAME

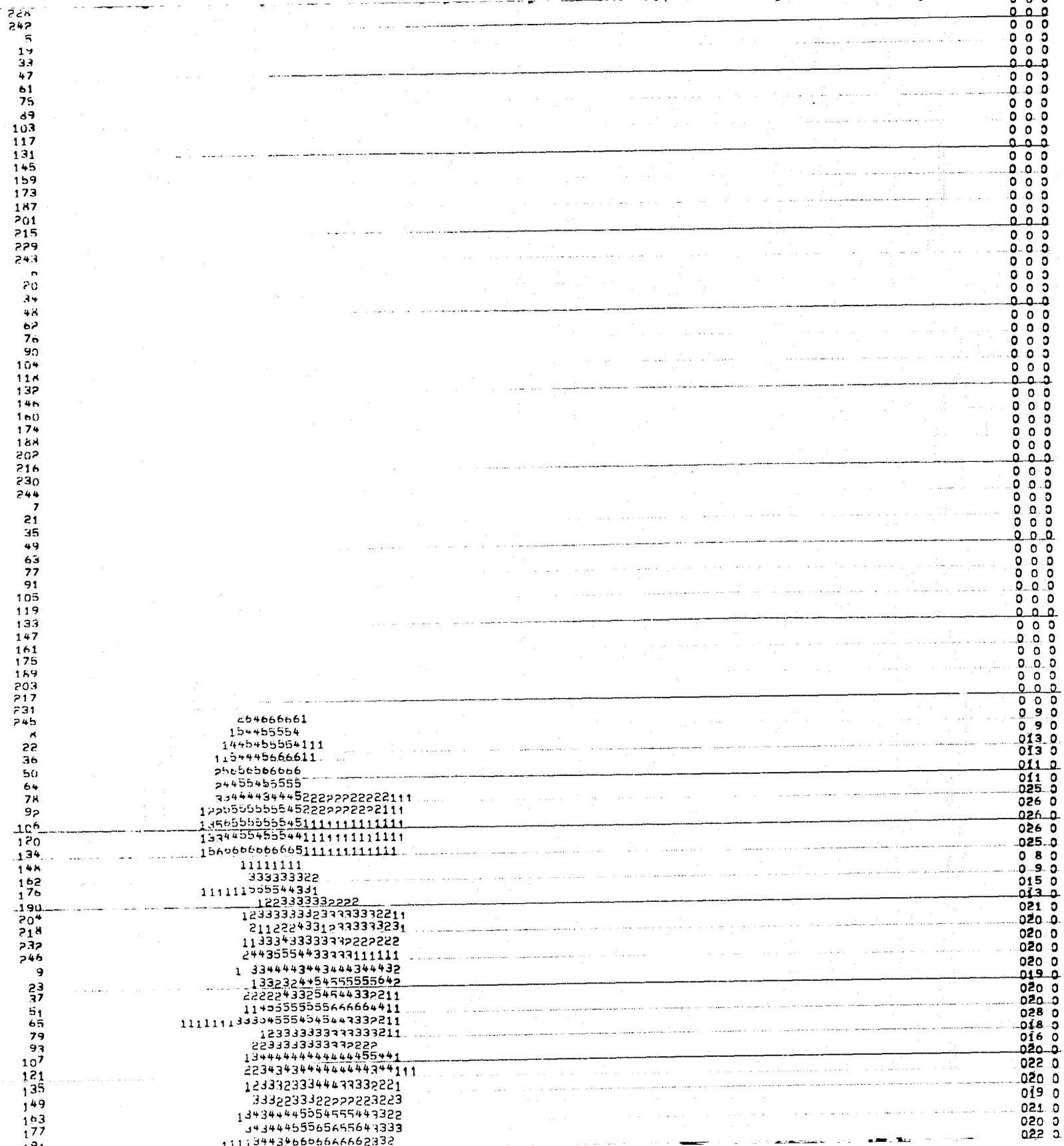


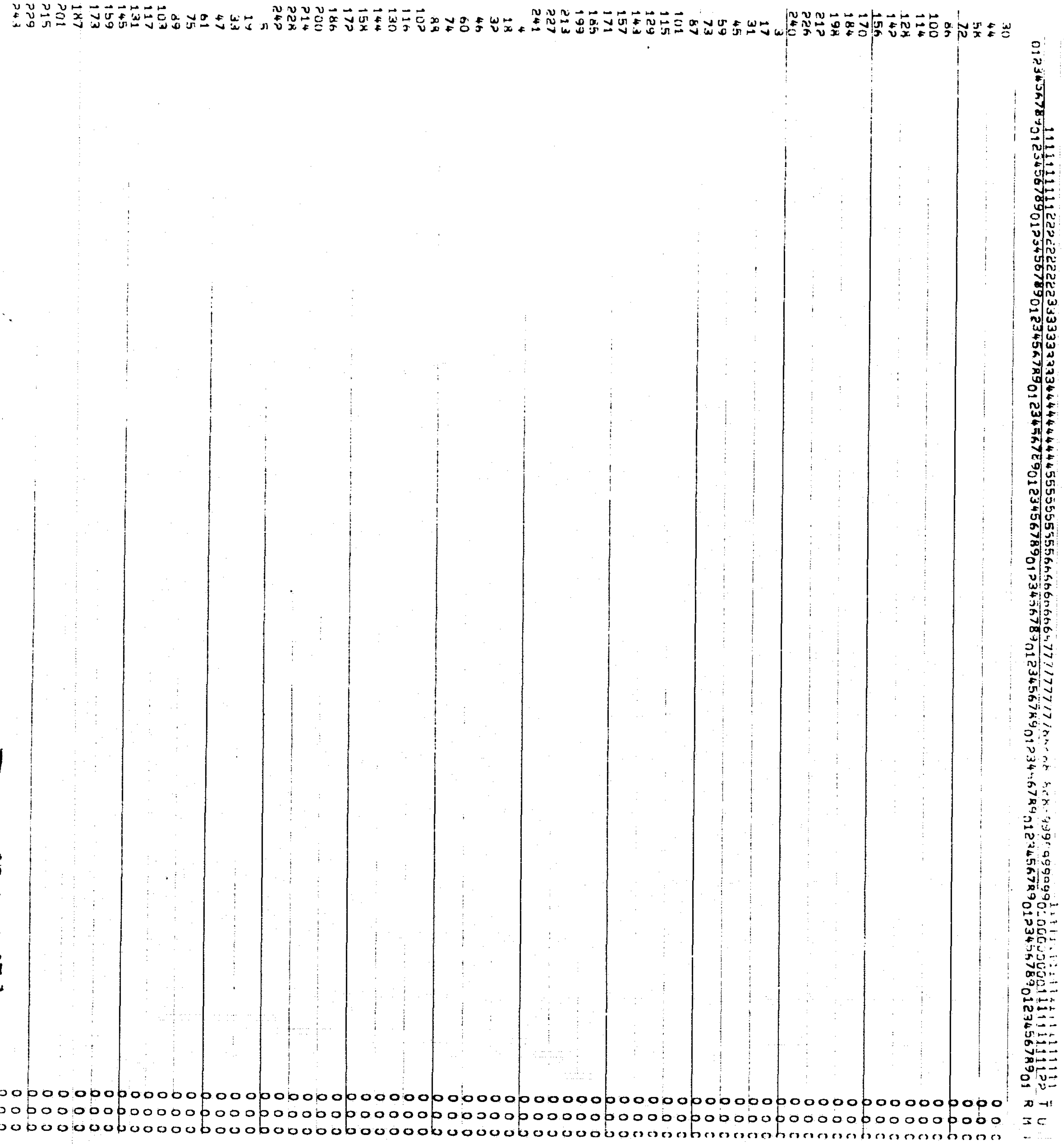
DATA USED FROM CYCLE 76 TO 81.
THE FOLLOWING MAP SHOWS HOW MANY TAKES WERE OBTAINED FOR EACH FRAME.

	IMAGE ACQUISITION				
	POSSIBLE	SCHED	ACQD	PROC	ACCEPT
TOTAL:	182226	6623	3819	3456	3456
	100.00%	3.63%	2.10%	1.90%	1.90%

GOOD	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	IMAGERY						AVAILABLE				
3456	379	986	295	266	210	183	158	167	200	465	147

FOLDOUT FRAME 2


0 0 0
0 9 0
013 0
011 0
025 0
026 0
026 0
026 0
025 0
0 8 0
0 9 0
015 0
013 0
021 0
020 0
020 0
020 0
019 0
020 0
020 0
028 0
018 0
016 0
020 0
022 0
020 0
019 0
021 0
020 0
022 0
OUTDOTT FRAME



FOLDOUT FRAME 4

Figure 17-3. MSS Scenes Imaged This Quarter

Table 17-1. MSS Telemetry Values

Function No.	Name		Telemetry Values in Orbits							
			20	5060	10587	15233	17824	19567	19957	20358
15044	FOPT 2 T	(DGC)	17.46	19.84	19.75	18.15	20.14	18.41	17.81	18.07
15046	ELEC CVR T	(DGC)	19.37	21.83	21.96	20.20	21.49	20.31	19.74	20.11
15048	SCAN MIR REG T	(DGC)	16.35	19.77	20.48	20.94	23.63	21.35	20.76	21.90
15050	SCAN MIR DR. COIL T	(DGC)	15.94	19.30	19.78	19.21	22.64	19.82	19.11	19.96
15052	ROT SHUT HSG T	(DGC)	16.91	20.07	20.23	18.74	20.52	19.09	18.52	18.78
15043	FOPT 1 T	(DGC)	17.67	20.01	19.93	18.35	20.33	18.59	18.02	18.28
15045	MUX PWR CASE T	(DGC)	21.19	22.03	23.87	26.92	30.84	26.47	26.27	28.63
15047	PWR SUP T	(DGC)	17.41	20.00	20.21	19.83	21.88	20.23	19.62	20.28
15049	SCAN MIR DR. ELC T	(DGC)	16.12	19.41	20.23	21.16	23.83	21.70	21.09	22.41
15051	SCAN MIR HSG T	(DGC)	15.60	19.05	19.49	18.40	22.00	19.06	18.29	19.04
15040	MUX -6 VDC	(TMV)	4.03	4.03	3.98	4.02	4.07	4.03	4.03	4.03
15042	AVE DENS DATA	(TMV)	1.67	2.13	2.05	2.28	2.08	2.28	2.28	2.28
15054	CAL LAMP CUR A	(TMV)	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12
15056	BAND 2 $\pm$ 15 VDC	(TMV)	5.10	5.10	5.04	5.10	5.10	5.10	5.10	5.10
15058	BAND 4 $\pm$ 15 VDC	(TMV)	5.10	5.10	5.04	5.10	5.10	5.10	5.10	5.10
15060	+ 12 -6 VDC REG	(TMV)	4.82	5.02	4.97	5.02	5.02	5.00	5.00	5.02
15062	+ 19 VDC REC OUT	(TMV)	4.80	4.90	4.97	5.03	5.03	5.03	5.03	5.03
15064	BAND 1 HV A	(TMV)	5.10	5.16	5.12	5.12	5.13	5.12	5.12	5.12
15066	BAND 2 HV A	(TMV)	4.50	4.52	4.52	4.50	4.52	4.50	4.50	4.50
15068	BAND 3 HV A	(TMV)	4.60	4.62	4.62	4.62	4.62	4.62	4.62	4.62
15070	SHUT MOT CON OUT	(TMV)	2.43	2.44	2.47	2.51	2.50	2.50	2.50	2.50
15041	S/D CONV REF V	(TMV)	5.93	5.93	5.87	5.93	5.93	5.93	5.92	5.92
15053	SCAN MIR REG V	(TMV)	4.42	4.51	4.51	4.61	4.60	4.61	4.61	4.61
15055	BAND 1 $\pm$ 15 V	(TMV)	4.97	4.97	4.92	4.97	4.97	4.97	4.97	4.97
15057	BAND 3 $\pm$ 15 V	(TMV)	5.00	5.00	4.94	5.00	5.00	5.00	5.00	5.00
15059	-15 VDC TEL.	(TMV)	5.02	5.02	5.02	5.02	5.02	5.02	5.02	5.02
15061	$\pm$ 5 VDC LOGIC REG	(TMV)	4.82	4.81	4.77	4.76	4.77	4.78	4.78	4.78
15063	-19 VDC REG OUT	(TMV)	3.43	3.39	3.50	3.58	3.57	3.57	3.57	3.57
15071	SCAN MIR DR. CLK	(TMV)	1.93	1.97	1.98	2.00	1.97	1.98	1.98	1.96

Table 17-2. MSS Response History
Landsat-1
Quantum Level for Selected Work
(0=Black: 63=White)

Band	Sensor	Quantum Level: 1st Year Launch	1st Year 2-4 Quar.	2nd Yr. 5-8 Quar.	3rd Yr. 9-12 Quar.	4th Yr. 13-15 Quar.	4th Yr. This Quar.	% Change Since Launch
1	1	43	39	39	38	37	37	-14
	2	44	39	40	40	39	38	-14
	3	43	38	40	40	39	39	- 9
	4	43	38	39	39	38	37	-14
	5	41	36	35	34	32	32	-22
2	6	43	39	41	41	40	39	- 9
	7	47	43	43	42	41	41	-13
	8	46	41.5	41	41	40	39	-15
	9	47	44	42.5	42	41	40	-15
	10	46	42	41.5	41	41	40	-13
	11	47	42.5	42	42	41	40	-15
	12	45	42	42.5	42	42	41	- 9
3	13	46	46	49	51	52	52	+13
	14	44	42	42	42	42	42	- 5
	15	45	42.5	42	41	41	40	-11
	16	40	37.5	37.5	37	37	37	- 8
	17	42	39	40	40	40	40	- 5
	18	44	40	40.5	41	41	40	- 9
4	19	28	28	27	25	23	23	-18
	20	25	26	25	23	21	20	-20
	21	26	27	26.5	25	23	23	-12
	22	23	23	22	21	19	19	-17
	23	22	22.5	23	21	21	21	- 5
	24	24	23.5	24	23	22	22	- 8
	Line Length	3221	3219	3217	3216	3215	3217	- 0.12

SECTION 18

DATA COLLECTION SUBSYSTEM (DCS)

The Data Collection Subsystem was turned OFF after Orbit 12690 on 19 January 1975, and has not been used in the last 18 months.

The DCS operated without anomaly throughout the 3-1/2 years of its operation. Only Receiver No. 1 was used. The DCS operated with ground DCP's out to 3500 Km range - its horizon - with a reception probability of about 99%. There has been no evidence of adjacent DCP interference, or grazing angle effects. Periods of interference have been traced to identifiable external ground signals and successfully eliminated.

FOLDOUT FRAME 1

Landsat-1 Anomalies and Observations

Date	Anomaly/Observation	How Observed	Comments
7/24/72	Sun Sensor Temperature High	Off-Line	No Action Required for ERTS-1; ERTS-B Redesigned
7/24/72	Solar Paddle Temperature Excursions Greater Than Expected	Off-Line	No Action Required for ERTS-1; Math Model Corrected
7/25/72	USB Power Output Decreasing	Off-Line	Switched to Side B in Orbit 10068 on 7/15/74 after decline to 0.14 watts. USB Side B stable and holding at 1.5 watts
8/03/72	WBVTR No. 2 Power Converter Shorted	Real Time & Off-Line	Turned All P/L Off During Pass. Formed NASA/GE/RCA Evaluation Committee. Disconnected since Anomaly. Redesigned for ERTS-B
8/03/72	Decrease in Solar Array Current	Off-Line	Evaluate Degradation Effect Due to Solar Flare Activity
8/06/72	RBV Power Transient PSM Turn-Off Failure	Real Time	NASA/GE/RCA Evaluation Committee Formed; RBV off since Anomaly; Redesigned PSM for ERTS-B
8/10/72	DCS Reject Messages Rose to Over 40% of Total Messages for 15 Days	Off-Line	External Interference; Located Source; No Serious Interference Since
8/10/72	MSS Cal Wedge Levels Decreasing	Off-Line	Leveled Off After Orbit 1000; At Or About 5% Below Earlier Values
8/03/72	Incorrect Time Tags in Comstor "B" Cell 12	Real Time	Reload Comstors and Verify; (Discontinued Active Use of Cell 12)
12/04/72 12/06/72	Pitch Motor Drive Duty Cycles Roll Increased for Short Yaw Period	Off-Line	Evaluate - Prepared Contingency Plan
3/29/73	WBVTR No. 1; High BER	Real Time	Formed NASA/GE/RCA Committee; Lapped Heads; Now in Operational Use. Temporarily Restricted to Last 600 Feet (600 Seconds) of Tape
4/08/72	Slow Leak in Forward IR Scanner Pressure	Off-Line	Not Expected to Interfere with Normal Operations
5/20/72	Defect in Signal of Left Cosine Pot at S/C Midnight	Off-Line	Not Expected to Interfere with Normal Operations
6/03/73	Failure of Integrated Circuit Chip and TLM of Functions 6012, 1011, 12238 and 7010	Real Time & Off-Line	TLM Failure only. S/C Operations Normal
11/5/73	WBVTR-1 Tape Unit Pressure Drop	Real Time	Defect in Pressure Instrumentation which Causes Occasional Rapid Pressure Drop in TLM - Returns to Normal
11/13/73	Solar Array Drive	Real Time	Slight Peaks on Drive Voltage Ripple which Picked up Limit Flag - Returned to Normal
11/28/73	High Head Wheel Current, WBVTR-1, During Rewind	Real Time	Resumed Operations After Investigation WBVTR-1 Performed in a Nominal Manner
12/20/73	Pitch Motor Driver Duty Cycle Increased	Real Time	Similar to Entry 12/4/72 except more Sustained
12/22/73	RMP-1 and RMP-2 Showed Excessive Noise/Output	Real Time	Condition Lasted for Several Orbits and Returned to Normal
2/20/74	Pitch Wheel Stopped During Sun Transient	Off-Line	During a sun transient in Orbit 8040 the pitch flywheel was changing directions. As it passed thru zero speed, the pitch flywheel stopped and did not resume operation until 2 minutes had elapsed in spite of application of 100% clockwise pitch motor driver duty cycle during that interval
3/5/74	WBVTR No. 1 High BER High HW-1	Real Time & Off Line	Limited Usage of Tape Footage
3/7/74	WBVTR-1 High HW-1	Real Time & Off Line	Suspended Operation Pending Study

		Off-Line	changing directions. As it passed thru zero speed, the pitch flywheel stopped and did not resume operation until 2 minutes had elapsed in spite of application of 100% clockwise pitch motor driver duty cycle during that interval
3/5/74	WBVTR No. 1 High BER High HW-1	Real Time & Off Line	Limited Usage of Tape Footage
3/7/74	WBVTR-1 High HW-1	Real Time & Off Line	Suspended Operation Pending Study
3/21/74	WBVTR-1 High HW-1	Real Time & Off Line	Suspended Operation Pending Study
3/27/74	WBVTR-1 MSFE Count High	Off-Line	Suspended Operation Pending Study
4/02/74	WBVTR-1 MFSE Count High	Off-Line	Suspended Operation Pending Study
5/21/74	Pitch CCW Motor Driver Duty Cycle Increased	Real Time & Off-Line	Similar to 12/4/72 entry. Returned to Normal
7/02/74	Pitch CCW Motor Driver Duty Cycle Increased	Real Time & Off-Line	Similar to 12/4/72 entry. Returned to Normal
7/02/74	WBVTR-1 High HW-1 and MFSE	Real Time & Off Line	Suspended operation pending study
8/06/74	Pitch CCW Motor Driver Duty Cycle Increase	Real Time & Off-Line	Similar to 12/4/72 entry. Returned to Normal
8/21/74	Pitch CCW Motor Driver Duty Cycle Increase	Real Time & Off-Line	Similar to 12/4/74 entry. Returned to Normal
8/28/74	Pitch CCW Motor Driver Duty Cycle Increase	Real Time & Off-Line	Similar to 12/4/74 entry. Returned to Normal
9/04/74	Pitch CCW Motor Driver Duty Cycle Increase	Real Time & Off-Line	Similar to 12/4/72 entry. Returned to Normal
9/09/74	Pitch CCW Motor Driver Duty Cycle Increase	Real Time & Off-Line	Similar to 12/4/72 entry. Returned to Normal
9/14/74	PSM Power Regulator Switchover from 1 to 2	Real Time	VHF interference signal present. Occurred at 02:46:21. Spacecraft was normal
9/23/74	PSM Power Regulator Switchover from 2 to 1	Real Time	VHF interference signal present. Occurred at 01:49:17. Spacecraft is normal
9/25/74	Pitch CCW Motor Driver Duty Cycle Increase	Real Time & Off-Line	Similar to 12/4/72 entry. Returned to Normal
9/29/74	Pitch Flywheel Stopped	Real Time	The pitch CCW motor driver duty cycle began increasing in Orbit 11120. The pitch flywheel stopped (from 400 RPM) following a sun transient in Orbit 11125. After a period of approximately 8 hours, and attitude disturbances, the pitch flywheel restarted. Earth acquisition was obtained and operations returned to normal in Orbit 11133.
10/09/74	RMP B Motor Current Variations	Off-Line & Real Time	As a precautionary measure a switch was made to RMP A in Orbit 11257. RMP B is still functioning and can be used in the event of RMP A failure
1/30/75	Solar Array Current Notch	On-Line	Solar array current drops 500-600 ma for 1 to 14 minutes early in the day then return to normal. Solar panel temperature range at notch is -20 to +20°C. No effect on S/C Mission
1/30/75	Narrow Band Recorder 2 Bit Error Rise	Real Time & Off-Line	Bit Errors began build up in Orbit 12837 and unit was turned off in Orbit 13015 on 2/12/75. Limited operation was resumed in Orbit 14116 and continued until failure to move tape in Orbit 15253
3/07/75	Battery 6 Turned Off	Real Time & Off-Line	Battery 6 decrease in load share and rose slightly in charge share thereby causing high overcharge. Battery temperature rose and required turn off of battery in Orbit 13346. Battery was allowed to discharge to -26.5 volts when it was turned on

FOLDOUT FRAME

LS-1

		Off-Line	Returned to Normal
9/14/74	PSM Power Regulator Switchover from 1 to 2	Real Time	VHF interference signal present. Occurred at 02:46:21. Spacecraft was normal
9/23/74	PSM Power Regulator Switchover from 2 to 1	Real Time	VHF interference signal present. Occurred at 01:49:17. Spacecraft is normal
9/25/74	Pitch CCW Motor Driver Duty Cycle Increase	Real Time & Off-Line	Similar to 12/4/72 entry. Returned to Normal
9/29/74	Pitch Flywheel Stopped	Real Time	The pitch CCW motor driver duty cycle began increasing in Orbit 11120. The pitch flywheel stopped (from 400 RPM) following a sun transient in Orbit 11125. After a period of approximately 8 hours, and attitude disturbances, the pitch flywheel restarted. Earth acquisition was obtained and operations returned to normal in Orbit 11133.
10/09/74	RMP B Motor Current Variations	Off-Line & Real Time	As a precautionary measure a switch was made to RMP A in Orbit 11257. RMP B is still functioning and can be used in the event of RMP A failure
1/30/75	Solar Array Current Notch	On-Line	Solar array current drops 500-600 ma for 1 to 14 minutes early in the day then return to normal. Solar panel temperature range at notch is -20 to +20°C. No effect on S/C Mission
1/30/75	Narrow Band Recorder 2 Bit Error Rise	Real Time & Off-Line	Bit Errors began build up in Orbit 12837 and unit was turned off in Orbit 13015 on 2/12/75. Limited operation was resumed in Orbit 14116 and continued until failure to move tape in Orbit 15253
3/07/75	Battery 6 Turned Off	Real Time & Off-Line	Battery 6 decrease in load share and rose slightly in charge share thereby causing high overcharge. Battery temperature rose and required turn off of battery in Orbit 13346. Battery was allowed to discharge to -26.5 volts when it was turned on in Orbit 14100. Normal operation resumed
6/18/75	Battery 6 Turned Off	Real Time & Off-Line	Battery 6 decreased in load share and rose in charge share thereby causing high overcharge. Battery temperature rose and required turn off of battery in Orbit 14780. Battery was allowed to discharge to -26.5 volts when it was turned on in Orbit 15467. Normal battery operation resumed.
7/18/75	Pitch Motor Driver Duty Cycle Increase and Pitch Flywheel Stopped	Real Time & Off-Line	The pitch flywheel motor driver duty cycle was high from Orbit 15191 to 15393 when it returned to normal. The pitch flywheel stopped for duration up to 202 minutes between Orbits 15303 to 15324.
8/6/75	High Current Transient When "All Battery On" Command Returned Battery 6 to Operation in Orbit 15467.	Real Time & Off-Line	High current transient caused low voltage tripping USB timer prematurely and low voltage pneumatic interlock. A short is postulated in switching relay located in ALC. "All Battery On" command restricted. Redesigned ALC for Landsat C.
8/15/75	Battery 8 Turned Off	Real Time & Off-Line	Battery 8 decreased in load share and rose in charge share thereby causing high overcharge. Battery temperature rose and required turn off of battery in Orbit 15558. Battery 8 will not be reactivated except in an emergency due to "All Battery On" command restriction.
4/20/76	Pitch Motor Driver Duty Cycle Increase.	On-Line	Similar to 12/4/72 entry - peaked at 35%. Returned to normal after rear scanner failure.
4/22/76	Rear Scanner Electrical Failure	On-Line	Rear Scanner became electrically intermittent in Orbit 19078 and failed in Orbit 19086. S/C switched to single scanner mode (forward scanner) in Orbit 19089 and normal ACS operation resumed.

LANDSAT-1

SPACECRAFT ORBIT REFERENCE TABLES

FROM JANUARY 1976 THRU DECEMBER 1977

ORBIT 17519 THRU 27711

FLIGHT DAY 1257 THRU 1987

LANDSAT-1

JAN, 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	1	1257	17519-17532	85- 98	7	70
2	2	1258	17533-17545	99-111	8	70
3	3	1259	17546-17559	112-125	9	70
4	4	1260	17560-17573	126-139	10	70
5	5	1261	17574-17587	140-153	11	70
6	6	1262	17588-17601	154-167	12	70
7	7	1263	17602-17615	168-181	13	70
8	8	1264	17616-17629	182-195	14	70
9	9	1265	17630-17643	196-209	15	70
10	10	1266	17644-17657	210-223	16	70
11	11	1267	17658-17671	224-237	17	70
12	12	1268	17672-17685	238-251	18	70
13	13	1269	17686-17699	1- 14	1	71
14	14	1270	17700-17713	15- 28	2	71
15	15	1271	17714-17727	29- 42	3	71
16	16	1272	17728-17741	43- 56	4	71
17	17	1273	17742-17755	57- 70	5	71
18	18	1274	17756-17769	71- 84	6	71
19	19	1275	17770-17783	85- 98	7	71
20	20	1276	17784-17796	99-111	8	71
21	21	1277	17797-17810	112-125	9	71
22	22	1278	17811-17824	126-139	10	71
23	23	1279	17825-17838	140-153	11	71
24	24	1280	17839-17852	154-167	12	71
25	25	1281	17853-17866	168-181	13	71
26	26	1282	17867-17880	182-195	14	71
27	27	1283	17881-17894	196-209	15	71
28	28	1284	17895-17908	210-223	16	71
29	29	1285	17909-17922	224-237	17	71
30	30	1286	17923-17936	238-251	18	71
31	31	1287	17937-17950	1- 14	1	72

LANDSAT-1

FEB. 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	32	1288	17951-17964	15- 28	2	72
2	33	1289	17965-17978	29- 42	3	72
3	34	1290	17979-17992	43- 56	4	72
4	35	1291	17993-18006	57- 70	5	72
5	36	1292	18007-18020	71- 84	6	72
6	37	1293	18021-18034	85- 98	7	72
7	38	1294	18035-18047	99-111	8	72
8	39	1295	18048-18061	112-125	9	72
9	40	1296	18062-18075	126-139	10	72
10	41	1297	18076-18089	140-153	11	72
11	42	1298	18090-18103	154-167	12	72
12	43	1299	18104-18117	168-181	13	72
13	44	1300	18118-18131	182-195	14	72
14	45	1301	18132-18145	196-209	15	72
15	46	1302	18146-18159	210-223	16	72
16	47	1303	18160-18173	224-237	17	72
17	48	1304	18174-18187	238-251	18	72
18	49	1305	18188-18201	1- 14	1	73
19	50	1306	18202-18215	15- 28	2	73
20	51	1307	18216-18229	29- 42	3	73
21	52	1308	18230-18243	43- 56	4	73
22	53	1309	18244-18257	57- 70	5	73
23	54	1310	18258-18271	71- 84	6	73
24	55	1311	18272-18285	85- 98	7	73
25	56	1312	18286-18298	99-111	8	73
26	57	1313	18299-18312	112-125	9	73
27	58	1314	18313-18326	126-139	10	73
28	59	1315	18327-18340	140-153	11	73
29	60	1316	18341-18354	154-167	12	73

LANDSAT-1

MAR. 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	61	1317	18355-18368	168-181	13	73
2	62	1318	18369-18382	182-195	14	73
3	63	1319	18383-18396	196-209	15	73
4	64	1320	18397-18410	210-223	16	73
5	65	1321	18411-18424	224-237	17	73
6	66	1322	18425-18438	238-251	18	73
7	67	1323	18439-18452	1- 14	1	74
8	68	1324	18453-18466	15- 28	2	74
9	69	1325	18467-18480	29- 42	3	74
10	70	1326	18481-18494	43- 56	4	74
11	71	1327	18495-18508	57- 70	5	74
12	72	1328	18509-18522	71- 84	6	74
13	73	1329	18523-18536	85- 98	7	74
14	74	1330	18537-18549	99-111	8	74
15	75	1331	18550-18563	112-125	9	74
16	76	1332	18564-18577	126-139	10	74
17	77	1333	18578-18591	140-153	11	74
18	78	1334	18592-18605	154-167	12	74
19	79	1335	18606-18619	168-181	13	74
20	80	1336	18620-18633	182-195	14	74
21	81	1337	18634-18647	196-209	15	74
22	82	1338	18648-18661	210-223	16	74
23	83	1339	18662-18675	224-237	17	74
24	84	1340	18676-18689	238-251	18	74
25	85	1341	18690-18703	1- 14	1	75
26	86	1342	18704-18717	15- 28	2	75
27	87	1343	18718-18731	29- 42	3	75
28	88	1344	18732-18745	43- 56	4	75
29	89	1345	18746-18759	57- 70	5	75
30	90	1346	18760-18773	71- 84	6	75
31	91	1347	18774-18787	85- 98	7	75

LANDSAT-1

APR, 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	92	1348	18786-18800	99-111	8	75
2	93	1349	18801-18814	112-125	9	75
3	94	1350	18815-18828	126-139	10	75
4	95	1351	18829-18842	140-153	11	75
5	96	1352	18843-18856	154-167	12	75
6	97	1353	18857-18870	168-181	13	75
7	98	1354	18871-18884	182-195	14	75
8	99	1355	18885-18898	196-209	15	75
9	100	1356	18899-18912	210-223	16	75
10	101	1357	18913-18926	224-237	17	75
11	102	1358	18927-18940	238-251	18	75
12	103	1359	18941-18954	1- 14	1	76
13	104	1360	18955-18968	15- 28	2	76
14	105	1361	18969-18982	29- 42	3	76
15	106	1362	18983-18996	43- 56	4	76
16	107	1363	18997-19010	57- 70	5	76
17	108	1364	19011-19024	71- 84	6	76
18	109	1365	19025-19038	85- 98	7	76
19	110	1366	19039-19051	99-111	8	76
20	111	1367	19052-19065	112-125	9	76
21	112	1368	19066-19079	126-139	10	76
22	113	1369	19080-19093	140-153	11	76
23	114	1370	19094-19107	154-167	12	76
24	115	1371	19108-19121	168-181	13	76
25	116	1372	19122-19135	182-195	14	76
26	117	1373	19136-19149	196-209	15	76
27	118	1374	19150-19163	210-223	16	76
28	119	1375	19164-19177	224-237	17	76
29	120	1376	19178-19191	238-251	18	76
30	121	1377	19192-19205	1- 14	1	77

LANDSAT-1

MAY, 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	122	1378	19206-19219	15- 28	2	77
2	123	1379	19220-19233	29- 42	3	77
3	124	1380	19234-19247	43- 56	4	77
4	125	1381	19248-19261	57- 70	5	77
5	126	1382	19262-19275	71- 84	6	77
6	127	1383	19276-19289	85- 98	7	77
7	128	1384	19290-19302	99-111	8	77
8	129	1385	19303-19316	112-125	9	77
9	130	1386	19317-19330	126-139	10	77
10	131	1387	19331-19344	140-153	11	77
11	132	1388	19345-19358	154-167	12	77
12	133	1389	19359-19372	168-181	13	77
13	134	1390	19373-19386	182-195	14	77
14	135	1391	19387-19400	196-209	15	77
15	136	1392	19401-19414	210-223	16	77
16	137	1393	19415-19428	224-237	17	77
17	138	1394	19429-19442	238-251	18	77
18	139	1395	19443-19456	1- 14	1	78
19	140	1396	19457-19470	15- 28	2	78
20	141	1397	19471-19484	29- 42	3	78
21	142	1398	19485-19498	43- 56	4	78
22	143	1399	19499-19512	57- 70	5	78
23	144	1400	19513-19526	71- 84	6	78
24	145	1401	19527-19540	85- 98	7	78
25	146	1402	19541-19553	99-111	8	78
26	147	1403	19554-19567	112-125	9	78
27	148	1404	19568-19581	126-139	10	78
28	149	1405	19582-19595	140-153	11	78
29	150	1406	19596-19609	154-167	12	78
30	151	1407	19610-19623	168-181	13	78
31	152	1408	19624-19637	182-195	14	78

LANDSAT-1

JUN.1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	153	1409	19638-19651	196-209	15	78
2	154	1410	19652-19665	210-223	16	78
3	155	1411	19666-19679	224-237	17	78
4	156	1412	19680-19693	238-251	18	78
5	157	1413	19694-19707	1- 14	1	79
6	158	1414	19708-19721	15- 28	2	79
7	159	1415	19722-19735	29- 42	3	79
8	160	1416	19736-19749	43- 56	4	79
9	161	1417	19750-19763	57- 70	5	79
10	162	1418	19764-19777	71- 84	6	79
11	163	1419	19778-19791	85- 98	7	79
12	164	1420	19792-19804	99-111	8	79
13	165	1421	19805-19818	112-125	9	79
14	166	1422	19819-19832	126-139	10	79
15	167	1423	19833-19846	140-153	11	79
16	168	1424	19847-19860	154-167	12	79
17	169	1425	19861-19874	168-181	13	79
18	170	1426	19875-19888	182-195	14	79
19	171	1427	19889-19902	196-209	15	79
20	172	1428	19903-19916	210-223	16	79
21	173	1429	19917-19930	224-237	17	79
22	174	1430	19931-19944	238-251	18	79
23	175	1431	19945-19958	1- 14	1	80
24	176	1432	19959-19972	15- 28	2	80
25	177	1433	19973-19986	29- 42	3	80
26	178	1434	19987-20000	43- 56	4	80
27	179	1435	20001-20014	57- 70	5	80
28	180	1436	20015-20028	71- 84	6	80
29	181	1437	20029-20042	85- 98	7	80
30	182	1438	20043-20055	99-111	8	80

LANDSAT-1

JUL, 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	183	1439	20056-20069	112-125	9	#0
2	184	1440	20070-20083	126-139	10	#0
3	185	1441	20084-20097	140-153	11	#0
4	186	1442	20098-20111	154-167	12	#0
5	187	1443	20112-20125	168-181	13	#0
6	188	1444	20126-20139	182-195	14	#0
7	189	1445	20140-20153	196-209	15	#0
8	190	1446	20154-20167	210-223	16	#0
9	191	1447	20168-20181	224-237	17	#0
10	192	1448	20182-20195	238-251	18	#0
11	193	1449	20196-20209	1- 14	1	#1
12	194	1450	20210-20223	15- 28	2	#1
13	195	1451	20224-20237	29- 42	3	#1
14	196	1452	20238-20251	43- 56	4	#1
15	197	1453	20252-20265	57- 70	5	#1
16	198	1454	20266-20279	71- 84	6	#1
17	199	1455	20280-20293	85- 98	7	#1
18	200	1456	20294-20306	99-111	8	#1
19	201	1457	20307-20320	112-125	9	#1
20	202	1458	20321-20334	126-139	10	#1
21	203	1459	20335-20348	140-153	11	#1
22	204	1460	20349-20362	154-167	12	#1
23	205	1461	20363-20376	168-181	13	#1
24	206	1462	20377-20390	182-195	14	#1
25	207	1463	20391-20404	196-209	15	#1
26	208	1464	20405-20418	210-223	16	#1
27	209	1465	20419-20432	224-237	17	#1
28	210	1466	20433-20446	238-251	18	#1
29	211	1467	20447-20460	1- 14	1	#2
30	212	1468	20461-20474	15- 28	2	#2
31	213	1469	20475-20488	29- 42	3	#2

LANDSAT-1

AUG. 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	214	1470	20489-20502	43- 56	4	#2
2	215	1471	20503-20516	57- 70	5	#2
3	216	1472	20517-20530	71- 84	6	#2
4	217	1473	20531-20544	85- 98	7	#2
5	218	1474	20545-20557	99-111	8	#2
6	219	1475	20558-20571	112-125	9	#2
7	220	1476	20572-20585	126-139	10	#2
8	221	1477	20586-20599	140-153	11	#2
9	222	1478	20600-20613	154-167	12	#2
10	223	1479	20614-20627	168-181	13	#2
11	224	1480	20628-20641	182-195	14	#2
12	225	1481	20642-20655	196-209	15	#2
13	226	1482	20656-20669	210-223	16	#2
14	227	1483	20670-20683	224-237	17	#2
15	228	1484	20684-20697	238-251	18	#2
16	229	1485	20698-20711	1- 14	1	#3
17	230	1486	20712-20725	15- 28	2	#3
18	231	1487	20726-20739	29- 42	3	#3
19	232	1488	20740-20753	43- 56	4	#3
20	233	1489	20754-20767	57- 70	5	#3
21	234	1490	20768-20781	71- 84	6	#3
22	235	1491	20782-20795	85- 98	7	#3
23	236	1492	20796-20808	99-111	8	#3
24	237	1493	20809-20822	112-125	9	#3
25	238	1494	20823-20836	126-139	10	#3
26	239	1495	20837-20850	140-153	11	#3
27	240	1496	20851-20864	154-167	12	#3
28	241	1497	20865-20878	168-181	13	#3
29	242	1498	20879-20892	182-195	14	#3
30	243	1499	20893-20906	196-209	15	#3
31	244	1500	20907-20920	210-223	16	#3

LANDSAT-1

SEP, 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	245	1501	20921-20934	224-237	17	#3
2	246	1502	20935-20948	238-251	18	#3
3	247	1503	20949-20962	1- 14	1	#4
4	248	1504	20963-20976	15- 28	2	#4
5	249	1505	20977-20990	29- 42	3	#4
6	250	1506	20991-21004	43- 56	4	#4
7	251	1507	21005-21018	57- 70	5	#4
8	252	1508	21019-21032	71- 84	6	#4
9	253	1509	21033-21046	85- 98	7	#4
10	254	1510	21047-21059	99-111	8	#4
11	255	1511	21060-21073	112-125	9	#4
12	256	1512	21074-21087	126-139	10	#4
13	257	1513	21088-21101	140-153	11	#4
14	258	1514	21102-21115	154-167	12	#4
15	259	1515	21116-21129	168-181	13	#4
16	260	1516	21130-21143	182-195	14	#4
17	261	1517	21144-21157	196-209	15	#4
18	262	1518	21158-21171	210-223	16	#4
19	263	1519	21172-21185	224-237	17	#4
20	264	1520	21186-21199	238-251	18	#4
21	265	1521	21200-21213	1- 14	1	#5
22	266	1522	21214-21227	15- 28	2	#5
23	267	1523	21228-21241	29- 42	3	#5
24	268	1524	21242-21255	43- 56	4	#5
25	269	1525	21256-21269	57- 70	5	#5
26	270	1526	21270-21283	71- 84	6	#5
27	271	1527	21284-21297	85- 98	7	#5
28	272	1528	21298-21310	99-111	8	#5
29	273	1529	21311-21324	112-125	9	#5
30	274	1530	21325-21338	126-139	10	#5

LANDSAT-1

OCT. 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	275	1531	21339-21352	140-153	11	#5
2	276	1532	21353-21366	154-167	12	#5
3	277	1533	21367-21380	168-181	13	#5
4	278	1534	21381-21394	182-195	14	#5
5	279	1535	21395-21408	196-209	15	#5
6	280	1536	21409-21422	210-223	16	#5
7	281	1537	21423-21436	224-237	17	#5
8	282	1538	21437-21450	238-251	18	#5
9	283	1539	21451-21464	1- 14	1	#6
10	284	1540	21465-21478	15- 28	2	#6
11	285	1541	21479-21492	29- 42	3	#6
12	286	1542	21493-21506	43- 56	4	#6
13	287	1543	21507-21520	57- 70	5	#6
14	288	1544	21521-21534	71- 84	6	#6
15	289	1545	21535-21548	85- 98	7	#6
16	290	1546	21549-21561	99-111	8	#6
17	291	1547	21562-21575	112-125	9	#6
18	292	1548	21576-21589	126-139	10	#6
19	293	1549	21590-21603	140-153	11	#6
20	294	1550	21604-21617	154-167	12	#6
21	295	1551	21618-21631	168-181	13	#6
22	296	1552	21632-21645	182-195	14	#6
23	297	1553	21646-21659	196-209	15	#6
24	298	1554	21660-21673	210-223	16	#6
25	299	1555	21674-21687	224-237	17	#6
26	300	1556	21688-21701	238-251	18	#6
27	301	1557	21702-21715	1- 14	1	#7
28	302	1558	21716-21729	15- 28	2	#7
29	303	1559	21730-21743	29- 42	3	#7
30	304	1560	21744-21757	43- 56	4	#7
31	305	1561	21758-21771	57- 70	5	#7

LANDSAT-1

NOVEMBER 1978

DATE	GMT DAY	F[illegible]GMT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	306	562	21772-21785	71- 84	6	17
2	307	563	21786-21799	85- 98	7	17
3	308	564	21800-21812	99-111	8	17
4	309	565	21813-21826	112-125	9	17
5	310	566	21827-21840	126-139	10	17
6	311	567	21841-21854	140-153	11	17
7	312	568	21855-21866	154-167	12	17
8	313	569	21867-21882	168-181	13	17
9	314	570	21883-21896	182-195	14	17
10	315	571	21897-21910	196-209	15	17
11	316	572	21911-21924	210-223	16	17
12	317	573	21925-21938	224-237	17	17
13	318	574	21939-21952	238-251	18	17
14	319	575	21953-21966	1- 14	1	18
15	320	576	21967-21980	15- 28	2	18
16	321	577	21981-21994	29- 42	3	18
17	322	578	21995-22008	43- 56	4	18
18	323	579	22009-22022	57- 70	5	18
19	324	580	22023-22036	71- 84	6	18
20	325	581	22037-22050	85- 98	7	18
21	326	582	22051-22063	99-111	8	18
22	327	583	22064-22077	112-125	9	18
23	328	584	22078-22091	126-139	10	18
24	329	585	22092-22105	140-153	11	18
25	330	586	22106-22119	154-167	12	18
26	331	587	22120-22133	168-181	13	18
27	332	588	22134-22147	182-195	14	18
28	333	589	22148-22161	196-209	15	18
29	334	590	22162-22175	210-223	16	18
30	335	591	22176-22189	224-237	17	18

LANDSAT-1

DEC. 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	336	1592	22190-22203	238-251	18	88
2	337	1593	22204-22217	1- 14	1	89
3	338	1594	22218-22231	15- 28	2	89
4	339	1595	22232-22245	29- 42	3	89
5	340	1596	22246-22259	43- 56	4	89
6	341	1597	22260-22273	57- 70	5	89
7	342	1598	22274-22287	71- 84	6	89
8	343	1599	22288-22301	85- 98	7	89
9	344	1600	22302-22314	99-111	8	89
10	345	1601	22315-22328	112-125	9	89
11	346	1602	22329-22342	126-139	10	89
12	347	1603	22343-22356	140-153	11	89
13	348	1604	22357-22370	154-167	12	89
14	349	1605	22371-22384	168-181	13	89
15	350	1606	22385-22398	182-195	14	89
16	351	1607	22399-22412	196-209	15	89
17	352	1608	22413-22426	210-223	16	89
18	353	1609	22427-22440	224-237	17	89
19	354	1610	22441-22454	238-251	18	89
20	355	1611	22455-22468	1- 14	1	90
21	356	1612	22469-22482	15- 28	2	90
22	357	1613	22483-22496	29- 42	3	90
23	358	1614	22497-22510	43- 56	4	90
24	359	1615	22511-22524	57- 70	5	90
25	360	1616	22525-22538	71- 84	6	90
26	361	1617	22539-22552	85- 98	7	90
27	362	1618	22553-22565	99-111	8	90
28	363	1619	22566-22579	112-125	9	90
29	364	1620	22580-22593	126-139	10	90
30	365	1621	22594-22607	140-153	11	90
31	366	1622	22608-22621	154-167	12	90

LANDSAT-1

JAN.1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	1	1623	22622-22635	168-181	13	a0
2	2	1624	22636-22649	182-195	14	a0
3	3	1625	22650-22663	196-209	15	a0
4	4	1626	22664-22677	210-223	16	a0
5	5	1627	22678-22691	224-237	17	a0
6	6	1628	22692-22705	238-251	18	a0
7	7	1629	22706-22719	1- 14	1	a1
8	8	1630	22720-22733	15- 28	2	a1
9	9	1631	22734-22747	29- 42	3	a1
10	10	1632	22748-22761	43- 56	4	a1
11	11	1633	22762-22775	57- 70	5	a1
12	12	1634	22776-22789	71- 84	6	a1
13	13	1635	22790-22803	85- 98	7	a1
14	14	1636	22804-22816	99-111	8	a1
15	15	1637	22817-22830	112-125	9	a1
16	16	1638	22831-22844	126-139	10	a1
17	17	1639	22845-22858	140-153	11	a1
18	18	1640	22859-22872	154-167	12	a1
19	19	1641	22873-22886	168-181	13	a1
20	20	1642	22887-22900	182-195	14	a1
21	21	1643	22901-22914	196-209	15	a1
22	22	1644	22915-22928	210-223	16	a1
23	23	1645	22929-22942	224-237	17	a1
24	24	1646	22943-22956	238-251	18	a1
25	25	1647	22957-22970	1- 14	1	a2
26	26	1648	22971-22984	15- 28	2	a2
27	27	1649	22985-22998	29- 42	3	a2
28	28	1650	22999-23012	43- 56	4	a2
29	29	1651	23013-23026	57- 70	5	a2
30	30	1652	23027-23040	71- 84	6	a2
31	31	1653	23041-23054	85- 98	7	a2

LANDSAT-1

FEB.1973

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	32	1654	23055-23067	99-111	8	a2
2	33	1655	23068-23081	112-125	9	a2
3	34	1656	23082-23095	126-139	10	a2
4	35	1657	23096-23109	140-153	11	a2
5	36	1658	23110-23123	154-167	12	a2
6	37	1659	23124-23137	168-181	13	a2
7	38	1660	23138-23151	182-195	14	a2
8	39	1661	23152-23165	196-209	15	a2
9	40	1662	23166-23179	210-223	16	a2
10	41	1663	23180-23193	224-237	17	a2
11	42	1664	23194-23207	238-251	18	a2
12	43	1665	23208-23221	1- 14	1	a3
13	44	1666	23222-23235	15- 28	2	a3
14	45	1667	23236-23249	29- 42	3	a3
15	46	1668	23250-23263	43- 56	4	a3
16	47	1669	23264-23277	57- 70	5	a3
17	48	1670	23278-23291	71- 84	6	a3
18	49	1671	23292-23305	85- 98	7	a3
19	50	1672	23306-23318	99-111	8	a3
20	51	1673	23319-23332	112-125	9	a3
21	52	1674	23333-23346	126-139	10	a3
22	53	1675	23347-23360	140-153	11	a3
23	54	1676	23361-23374	154-167	12	a3
24	55	1677	23375-23388	168-181	13	a3
25	56	1678	23389-23402	182-195	14	a3
26	57	1679	23403-23416	196-209	15	a3
27	58	1680	23417-23430	210-223	16	a3
28	59	1681	23431-23444	224-237	17	a3

LANDSAT-1

MAR-1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	60	1682	23445-23458	238-251	18	a3
2	61	1683	23459-23472	1- 14	1	a4
3	62	1684	23473-23486	15- 28	2	a4
4	63	1685	23487-23500	29- 42	3	a4
5	64	1686	23501-23514	43- 56	4	a4
6	65	1687	23515-23528	57- 70	5	a4
7	66	1688	23529-23542	71- 84	6	a4
8	67	1689	23543-23556	85- 98	7	a4
9	68	1690	23557-23569	99-111	8	a4
10	69	1691	23570-23583	112-125	9	a4
11	70	1692	23584-23597	126-139	10	a4
12	71	1693	23598-23611	140-153	11	a4
13	72	1694	23612-23625	154-167	12	a4
14	73	1695	23626-23639	168-181	13	a4
15	74	1696	23640-23653	182-195	14	a4
16	75	1697	23654-23667	196-209	15	a4
17	76	1698	23668-23681	210-223	16	a4
18	77	1699	23682-23695	224-237	17	a4
19	78	1700	23696-23709	238-251	18	a4
20	79	1701	23710-23723	1- 14	1	a5
21	80	1702	23724-23737	15- 28	2	a5
22	81	1703	23738-23751	29- 42	3	a5
23	82	1704	23752-23765	43- 56	4	a5
24	83	1705	23766-23779	57- 70	5	a5
25	84	1706	23780-23793	71- 84	6	a5
26	85	1707	23794-23807	85- 98	7	a5
27	86	1708	23808-23820	99-111	8	a5
28	87	1709	23821-23834	112-125	9	a5
29	88	1710	23835-23848	126-139	10	a5
30	89	1711	23849-23862	140-153	11	a5
31	90	1712	23863-23876	154-167	12	a5

LANDSAT-1

APR 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	91	1713	23877-23890	168-181	13	05
2	92	1714	23891-23904	182-195	14	05
3	93	1715	23905-23918	196-209	15	05
4	94	1716	23919-23932	210-223	16	05
5	95	1717	23933-23946	224-237	17	05
6	96	1718	23947-23960	238-251	18	05
7	97	1719	23961-23974	1- 14	1	06
8	98	1720	23975-23988	15- 28	2	06
9	99	1721	23989-24002	29- 42	3	06
10	100	1722	24003-24016	43- 56	4	06
11	101	1723	24017-24030	57- 70	5	06
12	102	1724	24031-24044	71- 84	6	06
13	103	1725	24045-24058	85- 98	7	06
14	104	1726	24059-24071	99-111	8	06
15	105	1727	24072-24085	112-125	9	06
16	106	1728	24086-24099	126-139	10	06
17	107	1729	24100-24113	140-153	11	06
18	108	1730	24114-24127	154-167	12	06
19	109	1731	24128-24141	168-181	13	06
20	110	1732	24142-24155	182-195	14	06
21	111	1733	24156-24169	196-209	15	06
22	112	1734	24170-24183	210-223	16	06
23	113	1735	24184-24197	224-237	17	06
24	114	1736	24198-24211	238-251	18	06
25	115	1737	24212-24225	1- 14	1	07
26	116	1738	24226-24239	15- 28	2	07
27	117	1739	24240-24253	29- 42	3	07
28	118	1740	24254-24267	43- 56	4	07
29	119	1741	24268-24281	57- 70	5	07
30	120	1742	24282-24295	71- 84	6	07

LANDSAT-1

MAY, 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	121	1743	24296-24309	85- 98	7	07
2	122	1744	24310-24322	99-111	8	07
3	123	1745	24323-24336	112-125	9	07
4	124	1746	24337-24350	126-139	10	07
5	125	1747	24351-24364	140-153	11	07
6	126	1748	24365-24378	154-167	12	07
7	127	1749	24379-24392	168-181	13	07
8	128	1750	24393-24406	182-195	14	07
9	129	1751	24407-24420	196-209	15	07
10	130	1752	24421-24434	210-223	16	07
11	131	1753	24435-24448	224-237	17	07
12	132	1754	24449-24462	238-251	18	07
13	133	1755	24463-24476	1- 14	1	08
14	134	1756	24477-24490	15- 28	2	08
15	135	1757	24491-24504	29- 42	3	08
16	136	1758	24505-24518	43- 56	4	08
17	137	1759	24519-24532	57- 70	5	08
18	138	1760	24533-24546	71- 84	6	08
19	139	1761	24547-24560	85- 98	7	08
20	140	1762	24561-24573	99-111	8	08
21	141	1763	24574-24587	112-125	9	08
22	142	1764	24588-24601	126-139	10	08
23	143	1765	24602-24615	140-153	11	08
24	144	1766	24616-24629	154-167	12	08
25	145	1767	24630-24643	168-181	13	08
26	146	1768	24644-24657	182-195	14	08
27	147	1769	24658-24671	196-209	15	08
28	148	1770	24672-24685	210-223	16	08
29	149	1771	24686-24699	224-237	17	08
30	150	1772	24700-24713	238-251	18	08
31	151	1773	24714-24727	1- 14	1	09

LANDSAT-1

JUNE 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	152	1774	24726-24741	15- 28	2	09
2	153	1775	24742-24755	29- 42	3	09
3	154	1776	24756-24769	43- 56	4	09
4	155	1777	24770-24783	57- 70	5	09
5	156	1778	24784-24797	71- 84	6	09
6	157	1779	24798-24811	85- 98	7	09
7	158	1780	24812-24824	99-111	8	09
8	159	1781	24825-24838	112-125	9	09
9	160	1782	24839-24852	126-139	10	09
10	161	1783	24853-24866	140-153	11	09
11	162	1784	24867-24880	154-167	12	09
12	163	1785	24881-24894	168-181	13	09
13	164	1786	24895-24908	182-195	14	09
14	165	1787	24909-24922	196-209	15	09
15	166	1788	24923-24936	210-223	16	09
16	167	1789	24937-24950	224-237	17	09
17	168	1790	24951-24964	238-251	18	09
18	169	1791	24965-24978	1- 14	1	10
19	170	1792	24979-24992	15- 28	2	10
20	171	1793	24993-25006	29- 42	3	10
21	172	1794	25007-25020	43- 56	4	10
22	173	1795	25021-25034	57- 70	5	10
23	174	1796	25035-25048	71- 84	6	10
24	175	1797	25049-25062	85- 98	7	10
25	176	1798	25063-25075	99-111	8	10
26	177	1799	25076-25089	112-125	9	10
27	178	1800	25090-25103	126-139	10	10
28	179	1801	25104-25117	140-153	11	10
29	180	1802	25118-25131	154-167	12	10
30	181	1803	25132-25145	168-181	13	10

LANDSAT-1

JULY 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	182	1804	25146-25159	182-195	14	1n0
2	183	1805	25160-25173	196-209	15	1n0
3	184	1806	25174-25187	210-223	16	1n0
4	185	1807	25188-25201	224-237	17	1n0
5	186	1808	25202-25215	238-251	18	1n0
6	187	1809	25216-25229	1- 14	1	1n1
7	188	1810	25230-25243	15- 28	2	1n1
8	189	1811	25244-25257	29- 42	3	1n1
9	190	1812	25258-25271	43- 56	4	1n1
10	191	1813	25272-25285	57- 70	5	1n1
11	192	1814	25286-25299	71- 84	6	1n1
12	193	1815	25300-25313	85- 98	7	1n1
13	194	1816	25314-25326	99-111	8	1n1
14	195	1817	25327-25340	112-125	9	1n1
15	196	1818	25341-25354	126-139	10	1n1
16	197	1819	25355-25368	140-153	11	1n1
17	198	1820	25369-25382	154-167	12	1n1
18	199	1821	25383-25396	168-181	13	1n1
19	200	1822	25397-25410	182-195	14	1n1
20	201	1823	25411-25424	196-209	15	1n1
21	202	1824	25425-25438	210-223	16	1n1
22	203	1825	25439-25452	224-237	17	1n1
23	204	1826	25453-25466	238-251	18	1n1
24	205	1827	25467-25480	1- 14	1	1n2
25	206	1828	25481-25494	15- 28	2	1n2
26	207	1829	25495-25508	29- 42	3	1n2
27	208	1830	25509-25522	43- 56	4	1n2
28	209	1831	25523-25536	57- 70	5	1n2
29	210	1832	25537-25550	71- 84	6	1n2
30	211	1833	25551-25564	85- 98	7	1n2
31	212	1834	25565-25577	99-111	8	1n2

LANDSAT-1

AUG. 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	213	1835	25578-25591	112-125	9	1n2
2	214	1836	25592-25605	126-139	10	1n2
3	215	1837	25606-25619	140-153	11	1n2
4	216	1838	25620-25633	154-167	12	1n2
5	217	1839	25634-25647	168-181	13	1n2
6	218	1840	25648-25661	182-195	14	1n2
7	219	1841	25662-25675	196-209	15	1n2
8	220	1842	25676-25689	210-223	16	1n2
9	221	1843	25690-25703	224-237	17	1n2
10	222	1844	25704-25717	238-251	18	1n2
11	223	1845	25718-25731	1- 14	1	1n3
12	224	1846	25732-25745	15- 28	2	1n3
13	225	1847	25746-25759	29- 42	3	1n3
14	226	1848	25760-25773	43- 56	4	1n3
15	227	1849	25774-25787	57- 70	5	1n3
16	228	1850	25788-25801	71- 84	6	1n3
17	229	1851	25802-25815	85- 98	7	1n3
18	230	1852	25816-25828	99-111	8	1n3
19	231	1853	25829-25842	112-125	9	1n3
20	232	1854	25843-25856	126-139	10	1n3
21	233	1855	25857-25870	140-153	11	1n3
22	234	1856	25871-25884	154-167	12	1n3
23	235	1857	25885-25898	168-181	13	1n3
24	236	1858	25899-25912	182-195	14	1n3
25	237	1859	25913-25926	196-209	15	1n3
26	238	1860	25927-25940	210-223	16	1n3
27	239	1861	25941-25954	224-237	17	1n3
28	240	1862	25955-25968	238-251	18	1n3
29	241	1863	25969-25982	1- 14	1	1n4
30	242	1864	25983-25996	15- 28	2	1n4
31	243	1865	25997-26010	29- 42	3	1n4

LANDSAT-1

SEP 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	244	1866	26011-26024	43- 56	4	1n4
2	245	1867	26025-26038	57- 70	5	1n4
3	246	1868	26039-26052	71- 84	6	1n4
4	247	1869	26053-26066	85- 98	7	1n4
5	248	1870	26067-26079	99-111	8	1n4
6	249	1871	26080-26093	112-125	9	1n4
7	250	1872	26094-26107	126-139	10	1n4
8	251	1873	26108-26121	140-153	11	1n4
9	252	1874	26122-26135	154-167	12	1n4
10	253	1875	26136-26149	168-181	13	1n4
11	254	1876	26150-26163	182-195	14	1n4
12	255	1877	26164-26177	196-209	15	1n4
13	256	1878	26178-26191	210-223	16	1n4
14	257	1879	26192-26205	224-237	17	1n4
15	258	1880	26206-26219	238-251	18	1n4
16	259	1881	26220-26233	1- 14	1	1n5
17	260	1882	26234-26247	15- 28	2	1n5
18	261	1883	26248-26261	29- 42	3	1n5
19	262	1884	26262-26275	43- 56	4	1n5
20	263	1885	26276-26289	57- 70	5	1n5
21	264	1886	26290-26303	71- 84	6	1n5
22	265	1887	26304-26317	85- 98	7	1n5
23	266	1888	26318-26330	99-111	8	1n5
24	267	1889	26331-26344	112-125	9	1n5
25	268	1890	26345-26358	126-139	10	1n5
26	269	1891	26359-26372	140-153	11	1n5
27	270	1892	26373-26386	154-167	12	1n5
28	271	1893	26387-26400	168-181	13	1n5
29	272	1894	26401-26414	182-195	14	1n5
30	273	1895	26415-26428	196-209	15	1n5

LANDSAT-1

OCT, 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	274	1896	26429-26442	210-223	16	1n5
2	275	1897	26443-26456	224-237	17	1n5
3	276	1898	26457-26470	238-251	18	1n5
4	277	1899	26471-26484	1- 14	1	1n6
5	278	1900	26485-26498	15- 28	2	1n6
6	279	1901	26499-26512	29- 42	3	1n6
7	280	1902	26513-26526	43- 56	4	1n6
8	281	1903	26527-26540	57- 70	5	1n6
9	282	1904	26541-26554	71- 84	6	1n6
10	283	1905	26555-26568	85- 98	7	1n6
11	284	1906	26569-26581	99-111	8	1n6
12	285	1907	26582-26595	112-125	9	1n6
13	286	1908	26596-26609	126-139	10	1n6
14	287	1909	26610-26623	140-153	11	1n6
15	288	1910	26624-26637	154-167	12	1n6
16	289	1911	26638-26651	168-181	13	1n6
17	290	1912	26652-26665	182-195	14	1n6
18	291	1913	26666-26679	196-209	15	1n6
19	292	1914	26680-26693	210-223	16	1n6
20	293	1915	26694-26707	224-237	17	1n6
21	294	1916	26708-26721	238-251	18	1n6
22	295	1917	26722-26735	1- 14	1	1n7
23	296	1918	26736-26749	15- 28	2	1n7
24	297	1919	26750-26763	29- 42	3	1n7
25	298	1920	26764-26777	43- 56	4	1n7
26	299	1921	26778-26791	57- 70	5	1n7
27	300	1922	26792-26805	71- 84	6	1n7
28	301	1923	26806-26819	85- 98	7	1n7
29	302	1924	26820-26832	99-111	8	1n7
30	303	1925	26833-26846	112-125	9	1n7
31	304	1926	26847-26860	126-139	10	1n7

LANDSAT-1

NOV. 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	305	1927	26861-26874	140-153	11	107
2	306	1928	26875-26888	154-167	12	107
3	307	1929	26889-26902	168-181	13	107
4	308	1930	26903-26916	182-195	14	107
5	309	1931	26917-26930	196-209	15	107
6	310	1932	26931-26944	210-223	16	107
7	311	1933	26945-26958	224-237	17	107
8	312	1934	26959-26972	238-251	18	107
9	313	1935	26973-26986	1- 14	1	108
10	314	1936	26987-27000	15- 28	2	108
11	315	1937	27001-27014	29- 42	3	108
12	316	1938	27015-27028	43- 56	4	108
13	317	1939	27029-27042	57- 70	5	108
14	318	1940	27043-27056	71- 84	6	108
15	319	1941	27057-27070	85- 98	7	108
16	320	1942	27071-27083	99-111	8	108
17	321	1943	27084-27097	112-125	9	108
18	322	1944	27098-27111	126-139	10	108
19	323	1945	27112-27125	140-153	11	108
20	324	1946	27126-27139	154-167	12	108
21	325	1947	27140-27153	168-181	13	108
22	326	1948	27154-27167	182-195	14	108
23	327	1949	27168-27181	196-209	15	108
24	328	1950	27182-27195	210-223	16	108
25	329	1951	27196-27209	224-237	17	108
26	330	1952	27210-27223	238-251	18	108
27	331	1953	27224-27237	1- 14	1	109
28	332	1954	27238-27251	15- 28	2	109
29	333	1955	27252-27265	29- 42	3	109
30	334	1956	27266-27279	43- 56	4	109

LANDSAT-1

DEC. 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	335	1957	27280-27293	57- 70	5	109
2	336	1958	27294-27307	71- 84	6	109
3	337	1959	27308-27321	85- 98	7	109
4	338	1960	27322-27334	99-111	8	109
5	339	1961	27335-27348	112-125	9	109
6	340	1962	27349-27362	126-139	10	109
7	341	1963	27363-27376	140-153	11	109
8	342	1964	27377-27390	154-167	12	109
9	343	1965	27391-27404	168-181	13	109
10	344	1966	27405-27418	182-195	14	109
11	345	1967	27419-27432	196-209	15	109
12	346	1968	27433-27446	210-223	16	109
13	347	1969	27447-27460	224-237	17	109
14	348	1970	27461-27474	238-251	18	109
15	349	1971	27475-27488	1- 14	1	110
16	350	1972	27489-27502	15- 28	2	110
17	351	1973	27503-27516	29- 42	3	110
18	352	1974	27517-27530	43- 56	4	110
19	353	1975	27531-27544	57- 70	5	110
20	354	1976	27545-27558	71- 84	6	110
21	355	1977	27559-27572	85- 98	7	110
22	356	1978	27573-27585	99-111	8	110
23	357	1979	27586-27599	112-125	9	110
24	358	1980	27600-27613	126-139	10	110
25	359	1981	27614-27627	140-153	11	110
26	360	1982	27628-27641	154-167	12	110
27	361	1983	27642-27655	168-181	13	110
28	362	1984	27656-27669	182-195	14	110
29	363	1985	27670-27683	196-209	15	110
30	364	1986	27684-27697	210-223	16	110
31	365	1987	27698-27711	224-237	17	110

APPENDIX C

LANDSAT-1 DOCUMENTS ISSUED THIS REPORT PERIOD

No.	Document No.	Title
1	PIR-14N5-L1-181	Thermal Performance of Landsat-1, dated 9/8/76
2	PIR-14N5-L1-182	MSS Imaging of Earth's Horizon on Landsat-1, dated 5/12/76
3	PIR-14N5-L1-183	Landsat-1 Rear Scanner Failure, dated 5/20/76
4	PIR-1N25-L2-187	Landsat WBVTR Error History, dated 9/9/76

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

INTRODUCTION

This is the seventh report in a continuing series of documents issued at launch, and thereafter quarterly, to present flight performance analysis of the Landsat-2 spacecraft. Previously issued documents are:

Document No.	Title	Date
75SDS4214	Landsat-2 Launch and Flight Activation Evaluation Report, 22 to 26 January 1975, Launch through Orbit 50 and Orbit Adjust Operation.	21 March 1975
75SDS4228	Landsat-1 and Landsat-2 Flight Evaluation Report, 23 January 1975 to 23 April 1975.	15 August 1975
75SDS4255	Landsat-1 and Landsat-2 Flight Evaluation Report, 23 April 1975 to 23 July 1975.	10 October 1975
75SDS4266	Landsat-1 and Landsat-2 Flight Evaluation Report, 23 July 1975 to 23 October 1975.	1 December 1975
76SDS4207	Landsat-1 and Landsat-2 Flight Evaluation Report, 23 October 1975 to 23 January 1976.	29 February 1976
76SDS4248	Landsat-1 and Landsat-2 Flight Evaluation Report, 23 January 1976 to 23 April 1976	14 July 1976

This report contains analysis of performance for Orbits 6370 to 7640 for Landsat-2.

SECTION 1

SUMMARY LANDSAT-2 OPERATIONS

The Landsat-2 spacecraft was launched from the Western Test Range on January 22, 1975, at 022:17:51.604. The launch and orbital injection phase of the space flight were nominal and deployment of the spacecraft followed predictions. All systems continue normal except Forward Scanner Pressure, Forward Scanner Pressure Telemetry, and Wideband Video Tape Recorder No. 1 (WBVTR-1). The Forward Scanner Pressure had begun leaking before launch but will not affect scanner performance. The Forward Scanner Pressure (Function 1003) telemetry became erratic in Orbit 2244 on 2 July 1975.

WBVTR-1 failed to rewind in Orbit 1021, 5 April 1975, and had intermittent operation to Orbit 1659, 21 May 1975, when normal operation was resumed. WBVTR-1 had a new anomaly in Orbit 2683 on 3 August 1975 when ground stations were unable to obtain video sync lockup because of failure of one of the 4 heads. As a result, it cannot be used with MSS data, but with ground hardware modifications it will perform satisfactorily with RBV data because RBV provides a synchronizing pulse which permits data from the bad head to be isolated and prior head data to be substituted. Since Orbit 7181 on 20 June 1976, the recorder has been used regularly in this service recording RBV data.

Spacecraft performance has not been degraded by these anomalies. Table 1-1 shows cumulative in-orbit payload system performance.

Table 1-1. In-Orbit Payload Systems Performance Launch Thru Orbit 7609 (7/21/76), Landsat-2

RBV	Total Scenes Imaged	1673
	Avg. Scenes/Day	15
	Total Area Imaged (millions of sq. mi.)	14.6
	ON TIME (hr)	14.9
	ON/OFF Cycles	137
	% Real Time Images	85
	% Recorded Images	15
MSS	Total Scenes Imaged	89,953
	Avg. Scenes/Day	158
	Total Area Imaged (millions of sq. n. mi.)	784
	ON TIME (hr)	1,101.0
	ON/OFF Cycles	7,907
	% Real Time Images	61
	% Recorded Images	39
DCS	Messages at OCC	673,990
	Non-Perfect MSGS	44,073
	Users	45
	ON TIME (hr)	12,241
WPA-1	% Real Time Mode	99
	% Playback Mode	1
	ON TIME (hr)	93.4
	ON/OFF Cycles	595
WPA-2	% Real Time Mode	65
	% P/B Mode	35
	ON TIME (hr)	876.9
	ON/OFF Cycles	4,929
WBVTR-1	% Record Mode	38
	% Playback Mode	41
	% Rewind Mode	20
	% Standby Mode	1
	Time Head-Tape Contact (hr)	111.2
	Cycles Head-Tape Contact	1,785
	ON TIME (hr)	140.9
WBVTR-2	% Record Mode	38
	% Playback Mode	41
	% Rewind Mode	20
	% Standby Mode	1
	MFSE Count in P/B	<10
	Time Head-Tape Contact (hr)	629.3
	Cycles Head-Tape Contact	7,432
	ON TIME (hr)	797.3

SECTION 2

ORBITAL PARAMETERS

Landsat-2, together with Landsat-1, has continued to provide the ground track repeat pattern required for the nine-day image coverage of the earth. During this report period, the ground track of Landsat-2 has been maintained within 3 NM longitude error at the equator. This has been done by controlling the ACS pitch gates through the use of pitch position bias mode. (See Section 4 also). Therefore, no orbit maintenance burn of the OAS was required during the current report period.

The error in longitude since launch as a function of time and orbit maintenance burns is shown in Figure 2-1. Figure 2-2 shows the change in sun time at the descending equatorial crossings.

As of 22 July 1976, Landsat-2 has descending equatorial crossings at approximately 9:24 AM local time as opposed to 8:54 AM for Landsat-1. A projection of the variation of local mean time at the descending nodes for both spacecrafts is given in Figure 2-3.

The difference in the orbital periods of Landsat-1 and Landsat-2 has been causing a drift in the angular phasing between the two satellites. At the end of this report period, the two spacecrafts are separated in their orbits by an angle of 77.6° in plane, Landsat-2 leading Landsat-1 GMT by 22.2 GMT minutes. Figure 2-4 is an approximation of the pattern of this drift since the beginning of Landsat-2 mission.

The Brouwer Mean Orbital Parameters for Landsat-2 are given in Table 2-1. Appendix B gives ground trace repeat cycle preditions.

Table 2-1. Landsat-2 Brouwer Mean Orbital Parameters

Element / Date	Apogee (KM)	Perigee (KM)	Inclination (Deg.)	Semi-Major Axis (KM)	Eccentricity	Two Body Period (Min)	Nodal Period (Min)	Argument of Perigee (Deg)	Right Ascension (Deg)	Mean Anomaly (Deg)
25 Jan 1975[1]	915.03	901.56	99.095	7286.462	0.000925	103.165	-	272.852	86.637	139.578
6 Feb 1975[2]	916.81	898.47	99.096	7285.820	0.001260	103.151	-	256.010	99.347	131.523
24 Apr 1975	917.85	897.40	99.079	7285.788	0.001103	103.151	103.266	62.55	174.339	117.183
25 July 1975	917.45	897.68	99.071	7285.733	0.001356	103.150	103.265	166.118	264.891	13.726
23 Oct 1975	916.70	898.49	99.059	7285.762	0.001250	103.150	103.266	282.749	353.366	257.271
24 Jan 1976	917.56	897.81	99.046	7285.751	0.001342	103.150	103.266	81.621	84.584	148.179
23 Apr 1976	917.67	897.44	99.029	7285.721	0.001389	103.149	103.265	139.745	172.774	40.033
22 July 76	916.62	898.46	99.021	7285.677	0.001251	103.148	103.264	253.964	260.924	286.634

1 Post launch

2 After the sequence of phasing maneuvers completed in Orbit 212

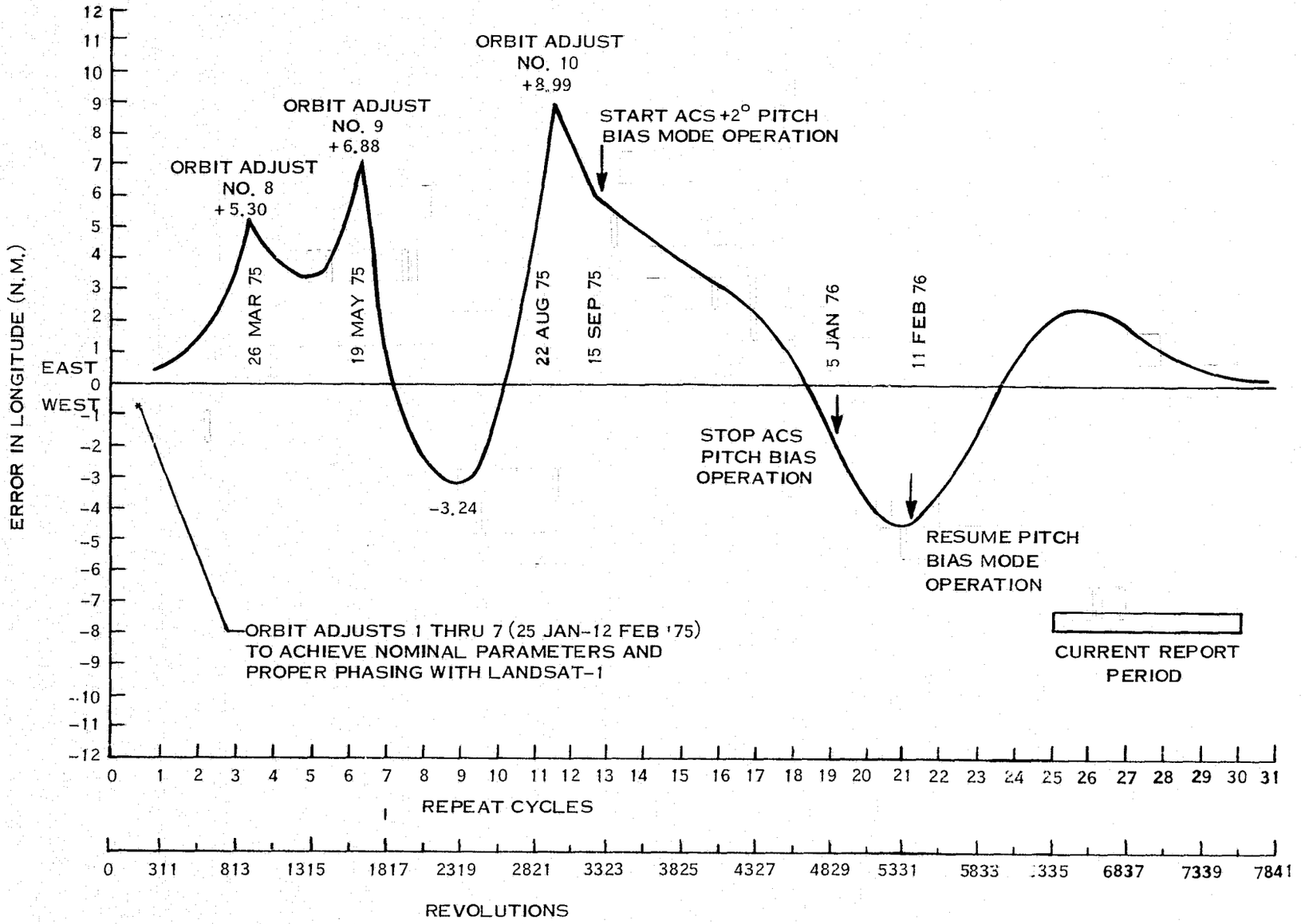


Figure 2-1. Effect of Orbit Adjusts and Pitch Position Bias on Landsat-2 Ground Track

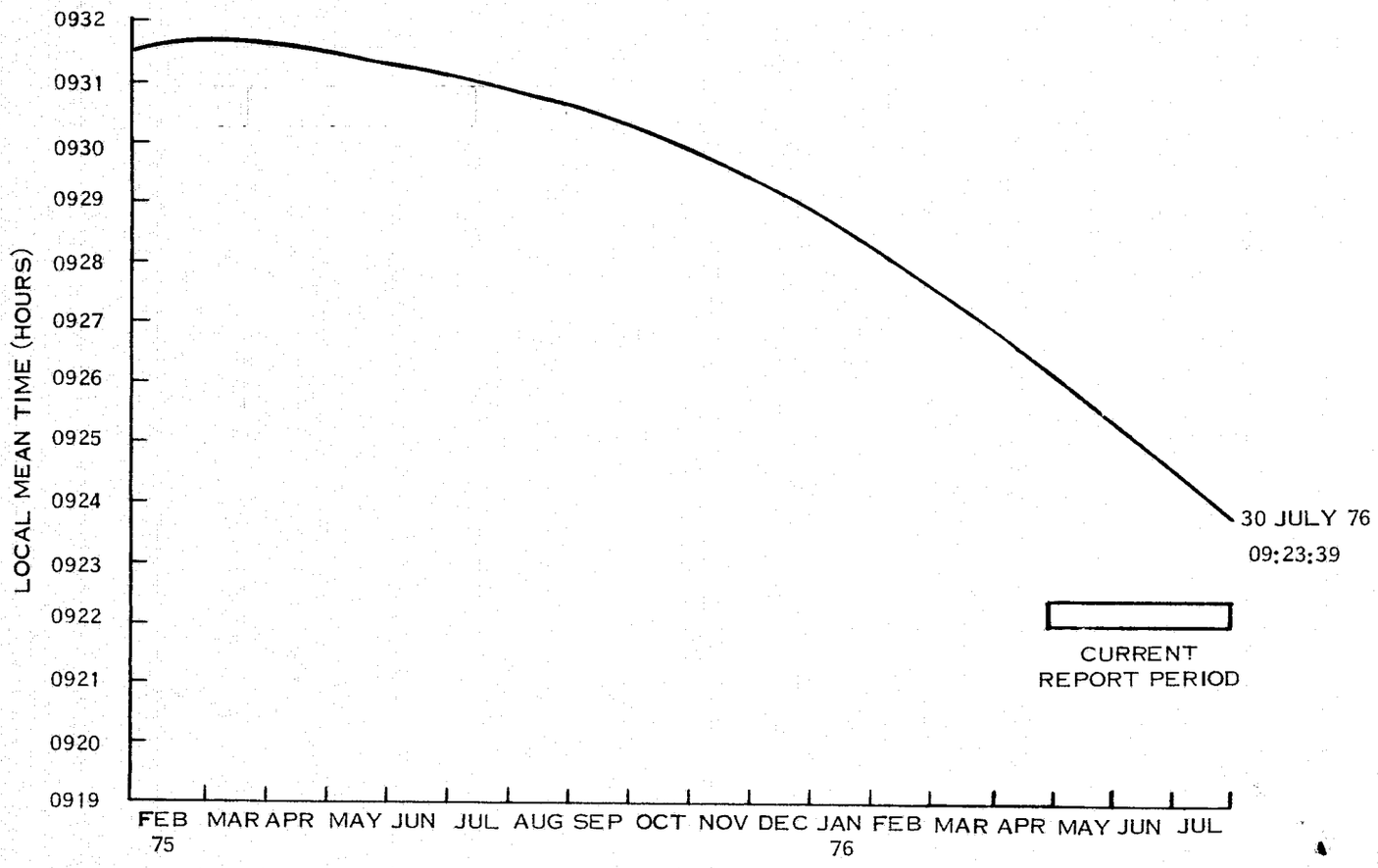
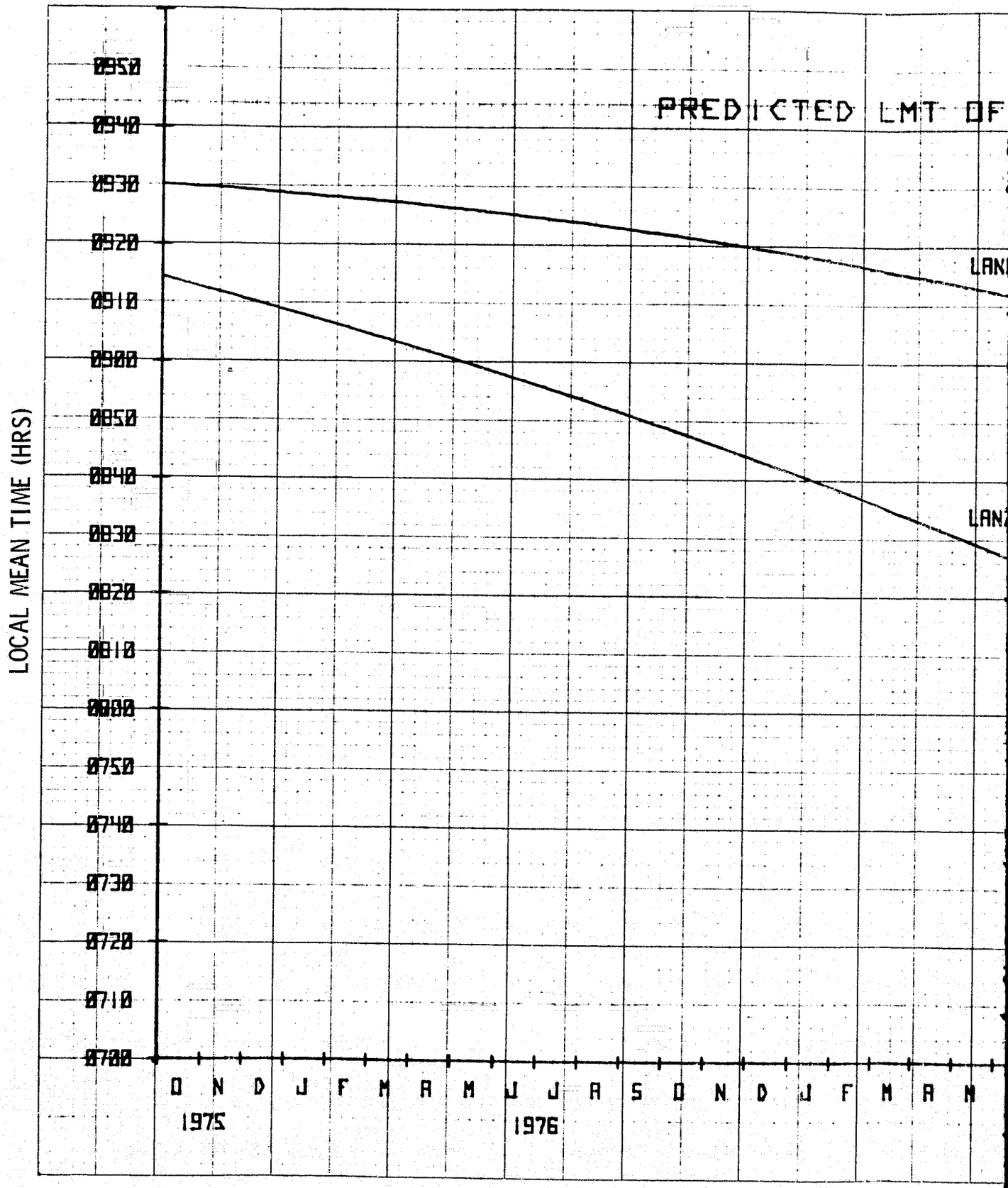


Figure 2-2. Local Mean Time of Descending Node



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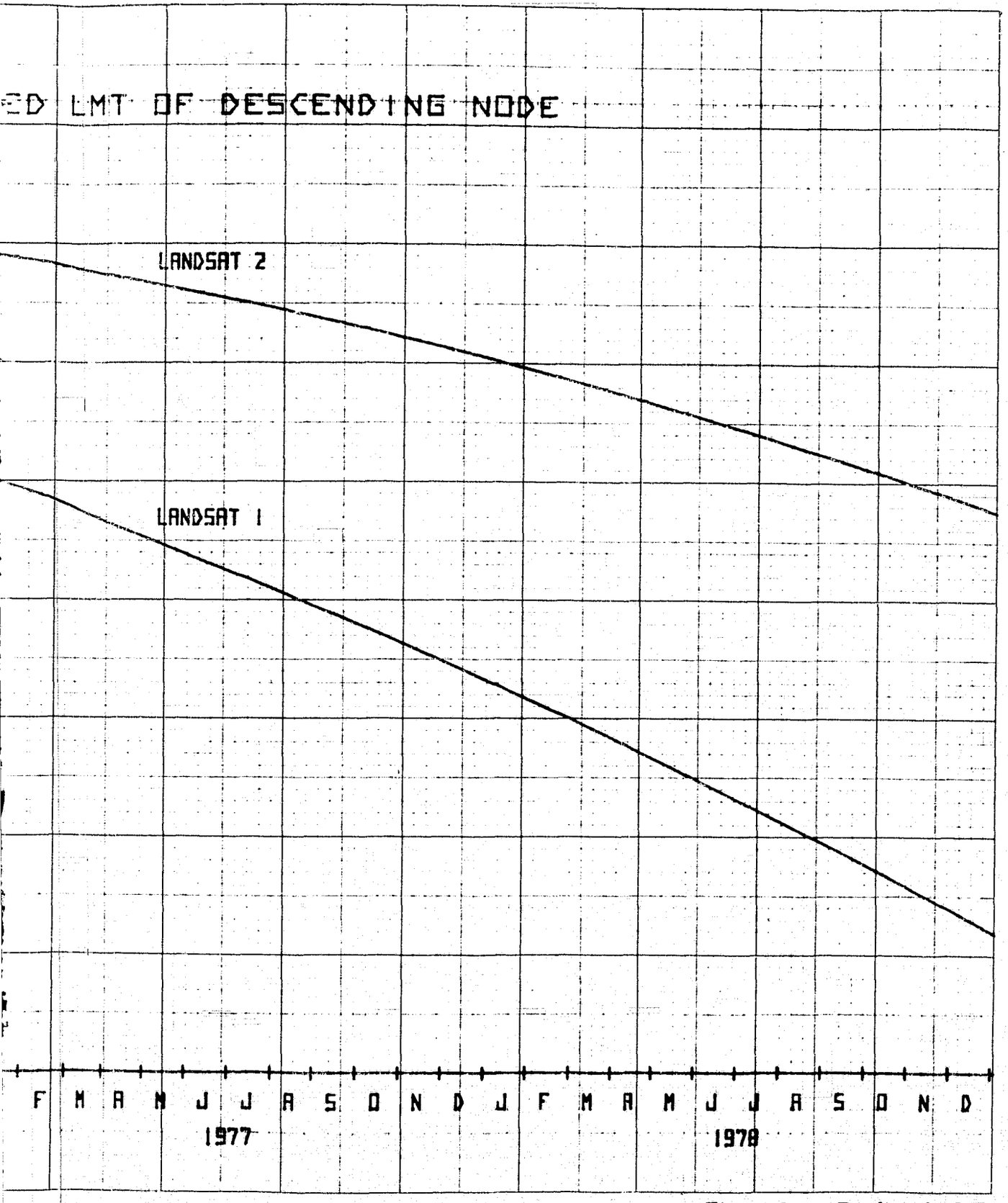

Figure 2-3. Predicted LMT of Descending Node

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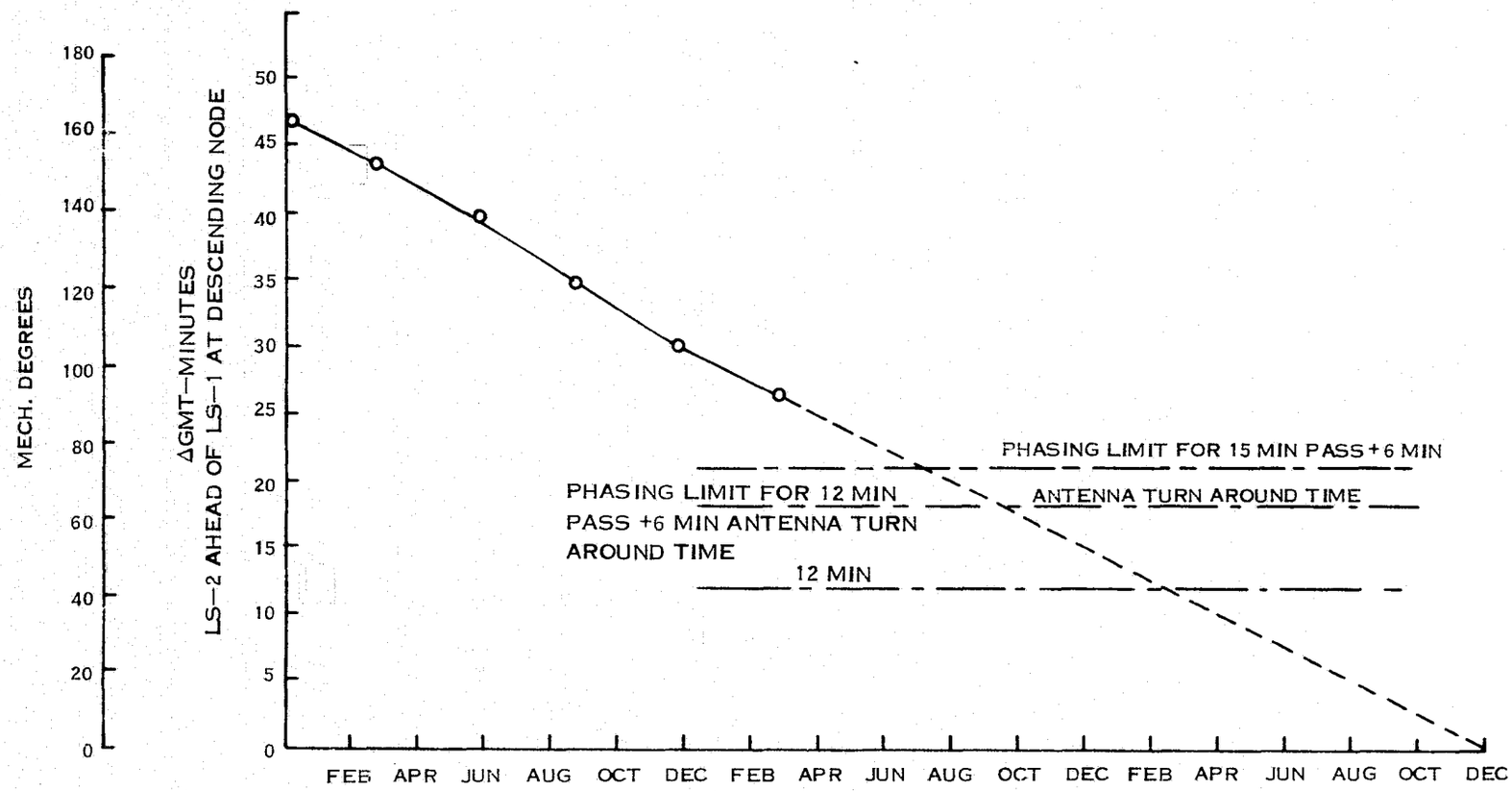


Figure 2-4. Drift in the Angular Phasing Between Landsat-1 and Landsat-2

SECTION 3

POWER SUBSYSTEM (PWR)

The Power Subsystem on Landsat-2 has performed satisfactorily throughout this report period.

The solar arrays continued to provide excess energy above spacecraft and payload requirements and are expected to support the Landsat-2 mission beyond 1976. The percentage degradation of the arrays is plotted as a function of days in orbit in Figure 3-1, along with the pre-launch predicted array degradation. The array degradation at the end of eighteen months in Orbit is 11.75%, which is slightly higher than predicted. The projected values of midday array current are plotted in Figure 3-2. Here the array current is adjusted for sun intensity and array degradation, as well as sun angle. Along with the same curve is plotted the actual telemetry values observed until the end of the current report period.

During Orbits 6451 and 6453 on 29 April 1976, Landsat-2 passed through the annular solar eclipse over the northern hemisphere. The loss in array energy was compensated by real-time adjustments to the auxiliary and compensation loads.

The battery packs averaged a typical 9 to 10% depth of discharge (DOD) during this report period. The charge and discharge characteristics of battery 6 became more unstable towards the end of this report period leading to high charge/discharge ratios and temperatures. Therefore, in Orbit 7601 (20 July 1976) the battery was taken off line for a restoration cycle similar to those done for battery 6 on Landsat-1. The battery is scheduled to be turned on when it discharges to about 26.5 volts through its small telemetry load. The charge and discharge characteristics of other batteries remained satisfactory although battery 1 assumed higher charge and lower discharge shares than others (see Table 3-1). The temperature spread between batteries ranged from 5.5 to 8.2°C, the higher spread being mainly due to battery 6 temperature. Since turn-off of battery 6, the temperature spread has decreased to about 5°C. Battery voltages have been maintained within suitable limits with Landsat-2 power management procedures, excess array energy being dissipated through auxiliary loads.

The power subsystem electronics have performed extremely well during this report period with all regulated voltages stable. Table 3-1 shows major subsystem parameters and Table 3-2 shows power subsystem telemetry for selected orbits. Some parameters in Table 3-1 may be slightly different from those in Table 3-2 because Table 3-1 uses a power management time span (night followed by day), whereas the time span used in Table 3-2 is the playback period from the NBR.

The shunt limiter on Landsat-2 has operated several times since launch and has held the solar array bus voltage at specified levels.

Figure 3-3 shows the actual variation in sun angle to orbit plane and solar panels for Landsat-2. Figure 3-4 is a prediction of the variations of the sun angle through 1977 for Landsat-1 and 2.

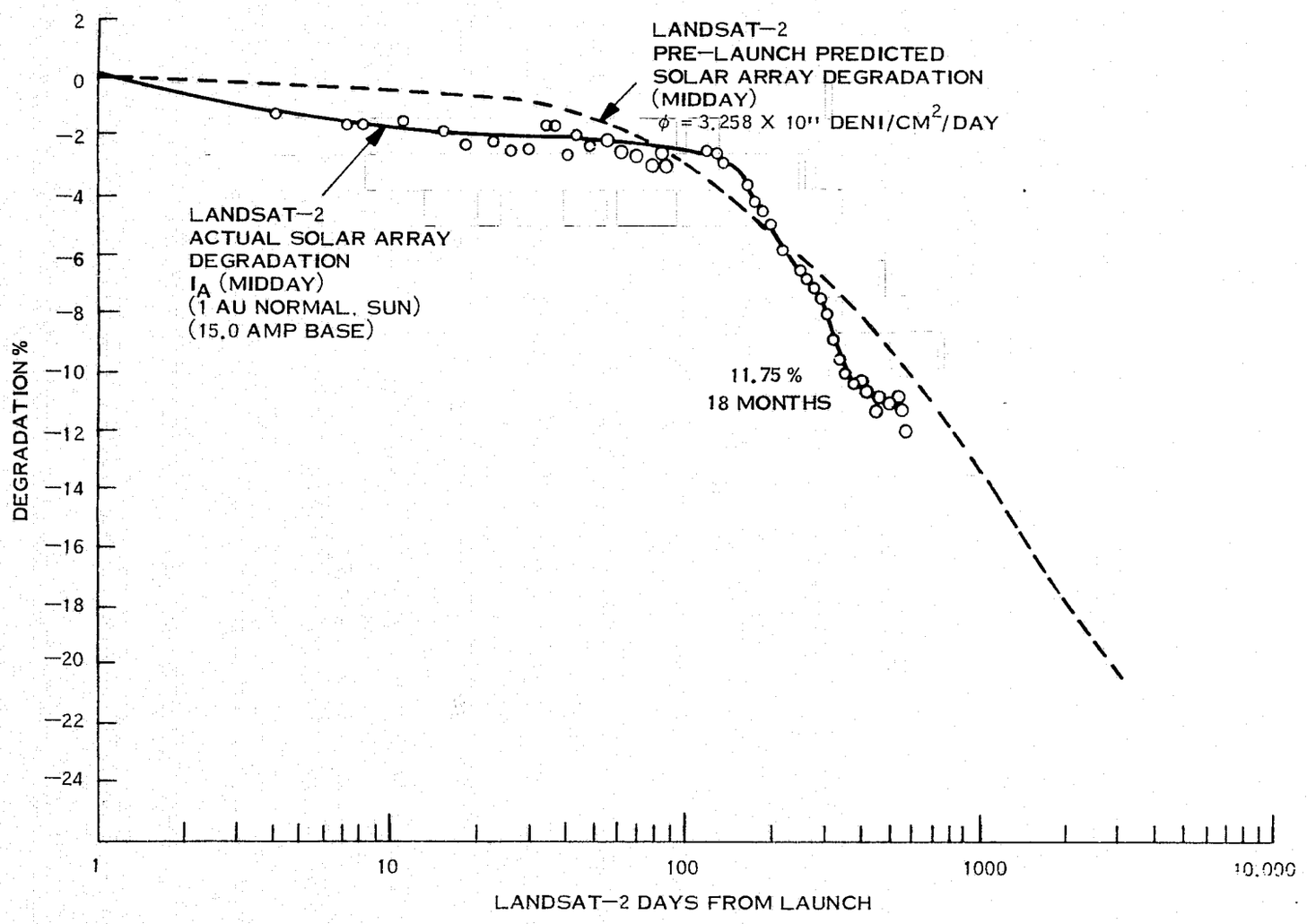


Figure 3-1. Landsat-2 I_A (Midday) Degradation vs. Days

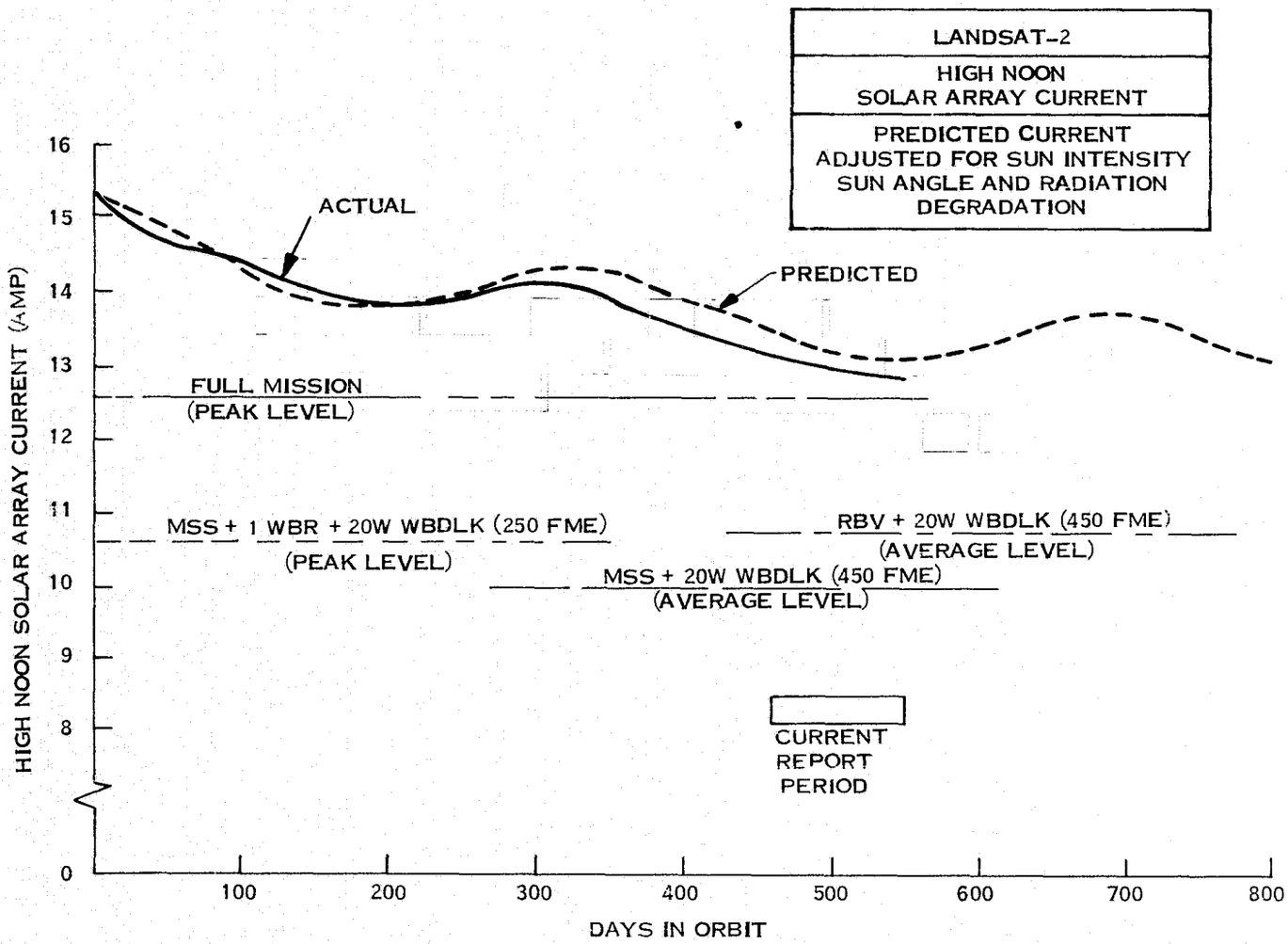


Figure 3-2. Landsat-2 Midday Solar Array Current

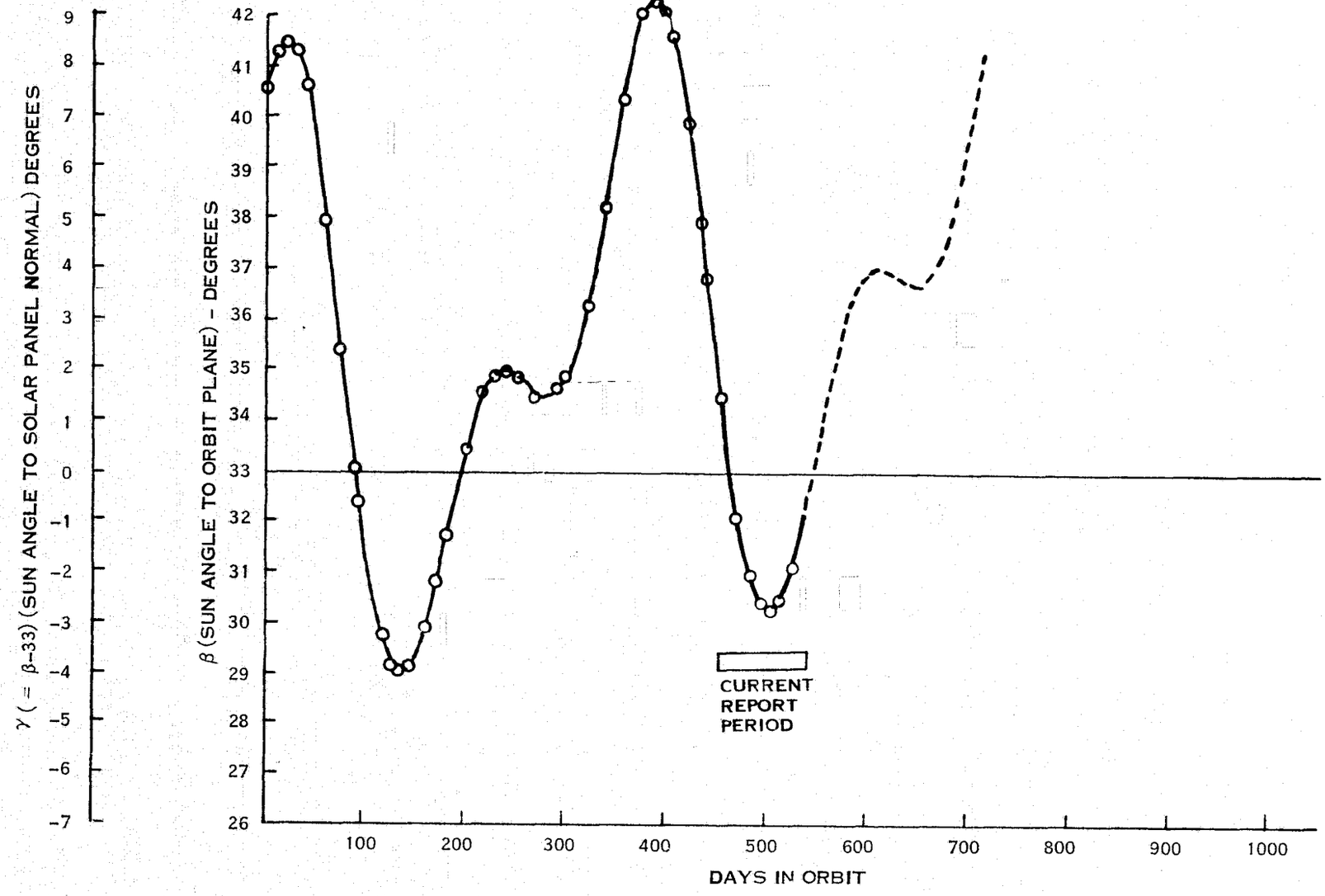
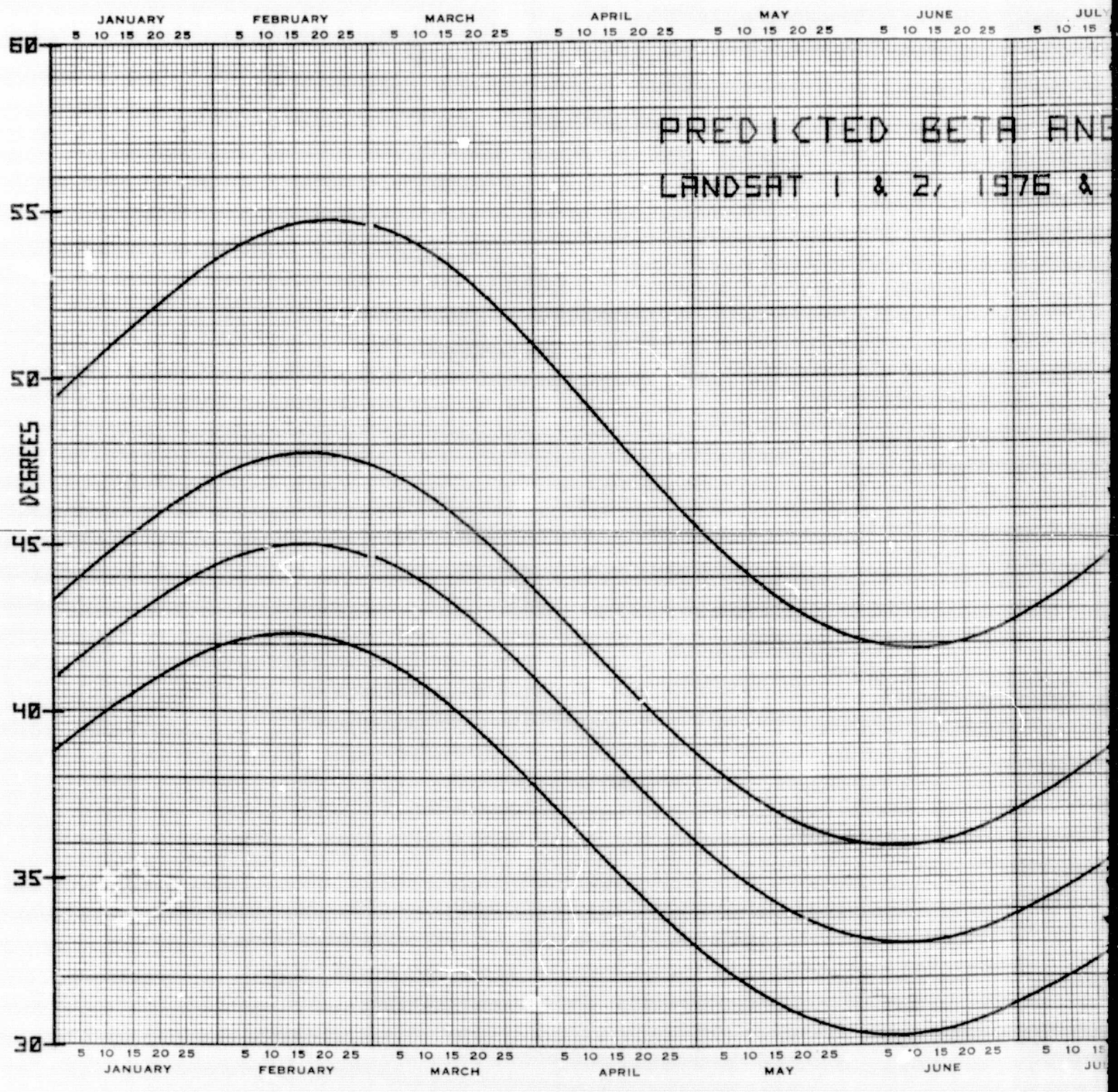


Figure 3-3. Landsat-2 Actual β and γ (Paddle) Sun Angles



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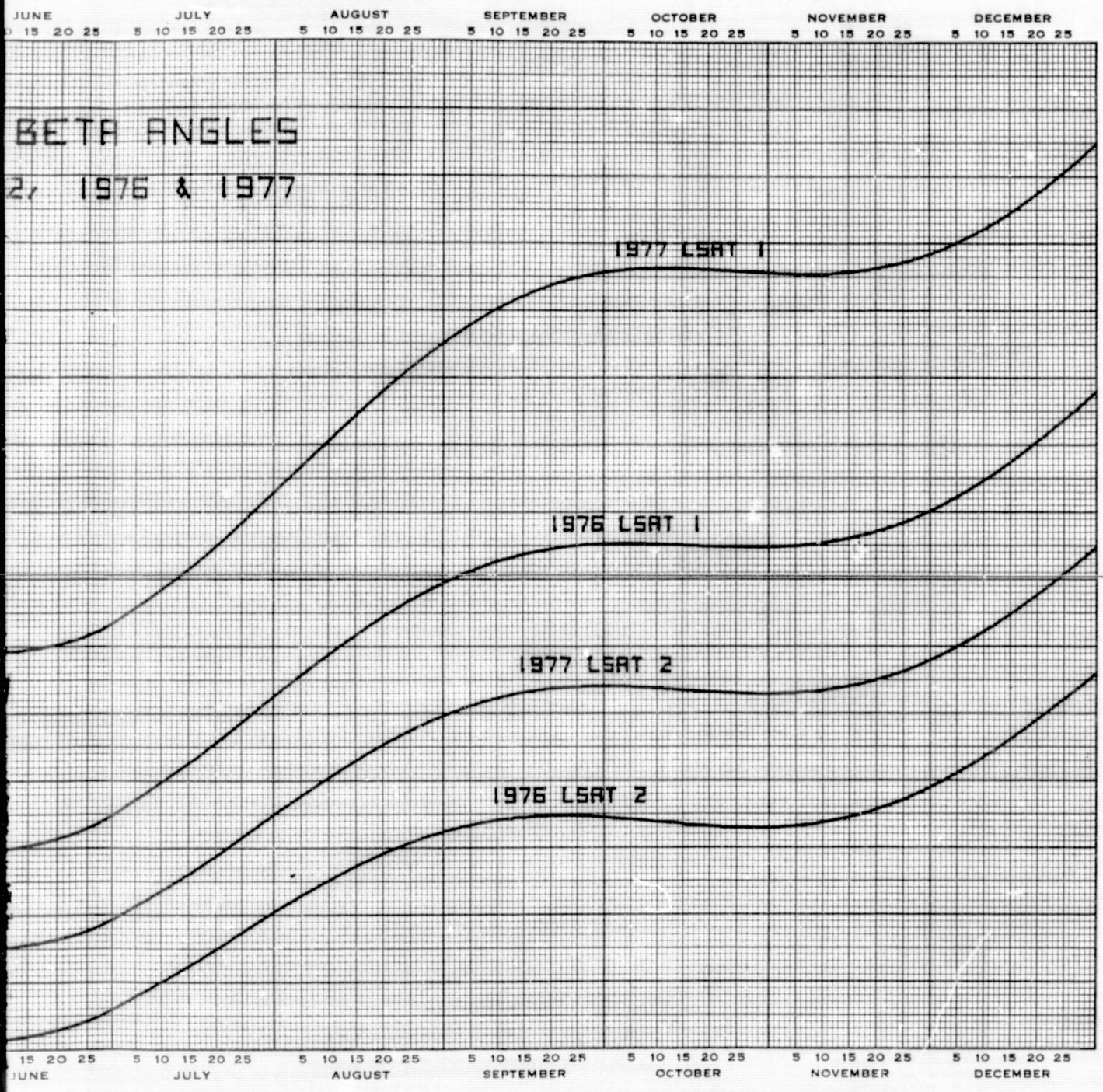


Figure 3-4. Predicted Beta Angles
for Landsat-1 and Landsat-2 - 1976 and 1977

Table 3-1. Landsat-2 Major Power Subsystem Parameters

Pwr. Mgmt. Orbit No.	50	2540	5100	6362	6791	7180	7640
Batt 1 Max	33.43	33.25	32.66	32.91	32.74	32.91	33.08
2 Chge	33.40	33.14	32.63	32.80	32.71	32.80	33.05
3 Volts	33.35	33.09	32.57	32.75	32.66	32.83	33.09
4	33.45	33.20	32.68	32.85	32.68	32.85	33.20
5	33.42	33.25	32.65	32.82	32.73	32.91	33.08
6	33.41	33.24	32.64	32.82	32.56	32.82	28.79
7	33.45	33.28	32.68	32.93	32.76	32.93	33.11
8	33.45	33.27	32.68	32.93	32.76	32.93	33.10
Average	33.42	33.21	32.65	32.85	32.70	32.87	33.10
Batt 1 End-of-Night	29.32	29.06	29.06	28.89	28.80	28.89	29.06
2 Volts	29.38	29.12	29.04	28.87	28.87	28.87	29.12
3	29.32	29.07	29.07	28.89	28.81	28.89	29.07
4	29.34	29.09	29.09	28.91	28.83	28.91	29.09
5	29.40	29.06	29.06	28.89	28.89	28.89	29.06
6	29.31	28.96	28.96	28.88	28.79	28.88	28.71
7	29.34	29.08	29.08	28.91	28.82	28.91	29.00
8	29.34	29.00	29.00	28.82	28.82	28.82	29.00
Average	29.34	29.05	29.04	28.88	28.83	28.88	29.06
Batt 1 Chge	12.76	12.13	12.43	13.22	12.44	12.61	15.51
2 Share	11.68	12.45	11.42	12.15	12.42	12.08	13.54
3 (%)	12.24	13.67	12.48	13.04	12.91	13.13	14.15
4	11.99	12.50	11.76	12.19	12.06	12.35	13.97
5	12.84	11.52	13.24	12.07	11.88	12.02	14.32
6	13.35	13.20	14.32	13.90	15.52	14.41	-
7	12.90	12.81	12.97	12.36	12.03	12.34	14.30
8	12.24	11.72	11.38	11.05	10.74	11.06	13.14
Batt 1 Load	12.60	11.35	11.80	10.87	10.97	11.48	12.84
2 Share	12.70	13.99	13.34	14.40	14.63	13.95	15.60
3 (%)	12.67	14.38	13.74	14.54	14.67	14.13	15.41
4	12.44	12.99	12.48	13.17	13.42	13.37	14.71
5	12.34	11.58	12.36	12.02	12.20	12.25	13.69
6	12.70	11.30	11.56	10.42	9.22	10.29	-
7	12.47	12.35	12.70	12.66	12.83	12.50	14.03
8	12.04	12.06	12.02	11.91	12.06	12.02	13.72
Batt 1 Temp	21.46	21.34	21.94	22.03	21.06	20.26	21.47
2 in	20.25	21.44	19.94	20.46	20.76	19.57	19.90
3 (°C)	18.60	19.18	17.86	18.05	18.09	17.38	17.79
4	20.83	20.91	20.36	20.20	20.21	20.14	20.37
5	24.98	22.31	27.27	23.04	22.35	21.87	22.64
6	24.26	23.01	27.28	24.38	24.71	23.10	20.49
7	24.71	23.62	26.32	24.10	22.74	22.03	22.90
8	23.63	22.71	24.41	23.01	21.80	21.37	22.40
Average	22.34	21.81	23.17	21.91	21.47	20.72	21.00
S/C Reg Bus Pwr. (W)	*	185.0	149.3	164.57	167.03	149.81	146.12
Comp Load Pwr. (W)	*	41.2	24.8	24.8	17.64	17.64	17.64
P/L Reg Bus Pwr. (W)	*	9.6	9.8	9.59	9.84	10.82	11.81
C/D Ratio	1.15	1.10	1.11	1.23	1.25	1.21	1.15
Total Charge (A-M)	271.9	267.55	223.46	256.44	262.53	259.02	239.11
Total Discharge (A-M)	237.2	244.33	201.45	208.58	209.30	213.84	207.47
Solar Array (A-M)	1106	981	1003	933	903	887	892
S.A. Peak I (Amp)	16.05	14.67	14.43	13.96	13.49	13.49	13.41
Midday Array I (Amp)	*	13.88	13.72	13.25	13.10	12.94	12.78
Sun Angle (Deg)	*	-1.22	8.35	1.2	-2.2	-2.4	0.3
Max R Pad Temp (°C)	*	59.60	63.20	59.60	58.40	58.40	58.40
Min R Pad Temp (°C)	*	-38.00	-35.00	-36.20	-38.00	-38.67	-38.00
Max L Pad Temp (°C)	*	56.92	62.15	57.69	56.92	57.69	56.92
Min L Pad Temp (°C)	*	-45.00	-42.14	-43.57	-45.71	-46.43	-45.71

* Data not processed and unavailable

**Bat 6 was turned off in orbit 7601 for a restoration cycle

+Average of batteries on line

Table 3-2. Landsat-2 Power Subsystem Analog Telemetry
(Average Value for Data Received in NBTR Playback)

Function	Description	Unit	Orbits						
			50	2532	5102	6362	6761	7210	7641
6001	Batt 1 Disc I	Amp	1.01	0.85	0.74	0.62	0.74	0.72	0.85
6002	2		1.01	0.97	0.84	0.82	0.91	0.88	1.02
6003	3		1.00	0.99	0.87	0.82	0.93	0.89	1.01
6004	4		1.00	0.93	0.78	0.74	0.88	0.84	0.97
6005	5		0.99	0.85	0.78	0.68	0.81	0.77	0.91
6006*	6		1.02	0.86	0.73	0.60	0.64	0.63	0.00
6007	7		1.00	0.91	0.80	0.70	0.81	0.81	0.92
6008	8		0.97	0.87	0.75	0.67	0.77	0.75	0.90
6011	Batt 1 Chg I	Amp	0.47	0.57	0.42	0.51	0.47	0.50	0.52
6012	2		0.43	0.57	0.38	0.47	0.45	0.50	0.46
6013	3		0.45	0.61	0.42	0.50	0.49	0.53	0.48
6014	4		0.44	0.57	0.39	0.47	0.45	0.49	0.47
6015	5		0.47	0.54	0.44	0.46	0.46	0.48	0.48
6016*	6		0.49	0.60	0.47	0.53	0.58	0.57	0.00
6017	7		0.47	0.60	0.43	0.48	0.46	0.50	0.48
6018	8		0.45	0.55	0.38	0.43	0.41	0.44	0.44
6021	Batt 1 Volt	VDC	31.50	30.92	31.11	30.99	31.00	30.93	31.42
6022	2		31.48	30.90	31.09	31.98	30.99	30.92	31.41
6023	3		31.49	30.91	31.10	31.00	31.01	30.94	31.43
6024	4		31.49	30.91	31.10	31.00	31.01	30.94	31.43
6025	5		31.50	30.92	31.11	31.00	31.01	30.94	31.43
6026*	6		31.49	30.90	31.08	30.97	30.96	30.89	28.69
6027	7		31.52	30.94	31.14	31.03	31.04	30.96	31.46
6028	8		31.49	30.92	31.11	31.01	31.01	30.94	31.43
6031	Batt 1 Temp	DGC	21.59	20.93	21.91	22.05	20.81	20.68	21.45
6032	2		20.53	20.75	19.90	20.46	20.09	20.31	19.86
6033	3		18.80	18.66	17.77	18.04	17.72	17.76	17.45
6034	4		20.90	20.88	20.33	20.21	20.23	20.14	20.34
6035	5		25.16	22.22	27.18	23.04	22.40	21.96	22.62
6036	6		24.37	22.55	27.19	24.41	24.39	23.76	20.12
6037	7		24.83	23.26	26.19	24.08	22.40	22.44	22.89
6038	8		23.75	22.52	24.36	23.01	21.74	21.65	22.36
6040	Rt. Pad Temp	DGC	28.96	26.16	30.90	26.98	24.69	24.31	25.31
6041	Rt. Pad VM	VDC	33.72	33.56	32.86	33.34	33.57	33.47	34.00
6042	Rt. Pad VN	VDC	33.46	33.18	32.44	32.88	33.34	33.18	33.45
6044	Lt. Pad Temp	DGC	25.56	21.16	28.22	23.47	26.37	26.51	22.55
6045	Lt. Pad VF	VDC	34.40	33.80	33.82	33.80	33.84	33.77	34.39
6046	Lt. Pad VG	VDC	34.48	33.91	33.91	33.87	33.92	33.84	34.48
6050	S/C UR Bus V	VDC	31.73	31.14	31.33	31.19	31.24	31.14	31.69
6051	S/C RG Bus V	VDC	24.57	24.57	24.58	24.58	24.58	24.57	24.58
6052	Aux Reg AV	VDC	23.36	23.40	23.44	23.44	23.42	23.43	23.43
6053	Aux Reg BV	VDC	23.37	23.39	23.44	23.43	23.41	23.40	23.44
6054	Solar I	Amp	14.81	13.76	13.40	12.85	12.63	12.43	12.37
6056	S/C RG Bus I	Amp	7.23	7.17	6.28	6.67	6.43	6.80	5.98
6068	PC Mod T1	DGC	21.67	21.98	20.77	21.46	21.12	21.58	20.49
6059	PC Mod T2	DGC	20.44	20.53	19.56	19.81	19.69	19.78	19.39
6070	P/L RG Bus V	VDC	24.61	24.60	24.60	24.60	24.60	24.60	24.62
6071	P/L UR Bus V	VDC	31.85	31.21	31.40	31.25	31.31	31.20	31.79
6073	P Aux AV	VDC	23.47	23.51	23.51	23.50	23.50	23.51	23.50
6074	P Aux BV	VDC	23.46	23.51	23.51	23.50	23.51	23.51	23.50
6075	PR Mod T1	DGC	20.84	21.39	20.32	20.76	20.74	21.07	20.21
6076	PR Mod T2	DGC	22.13	22.38	21.79	22.12	22.03	22.24	21.72
6079	Fuse Blow V	VDC	24.48	24.48	24.49	24.48	24.47	24.47	24.51
6080	Shunt 1 I	Amp	0.0	0.0	0.00	0.00	0.00	0.00	0.00
6081	2		0.0	0.0	0.00	0.00	0.00	0.00	0.00
6082	3		0.0	0.0	0.00	0.00	0.00	0.00	0.00
6083	4		0.0	0.0	0.00	0.00	0.00	0.00	0.00
6084	5		0.0	0.0	0.00	0.00	0.00	0.00	0.00
6085	6		0.0	0.0	0.00	0.00	0.00	0.00	0.00
6086	7		0.0	0.0	0.00	0.00	0.00	0.00	0.00
6087	8		0.0	0.0	0.00	0.00	0.00	0.00	0.00
6100	P/L RG Bus I	Amp	0.38	0.80	0.54	0.39	0.46	0.53	0.43
Total No.	Major Frames	Frm	396	387	785	384	785	785	788

*Battery 6 was turned off in orbit 7601 for a restoration cycle

SECTION 4

ATTITUDE CONTROL SUBSYSTEM (ACS)

Landsat-2's Attitude Control System performed normally since launch and has consistently maintained correct spacecraft attitude.

Low pressure in the Forward Scanner resulting from a pre-launch leak has had no effect on the ACS Subsystem's performance.

The program implemented in September 1975 to minimize spacecraft ground track drift by controlling Pitch gating was continued during this quarter. Table 4-1 summarizes the Pitch Position Bias mode sequences implemented this quarter as part of this program, and Figure 2-1 in Section 2 shows the effects of Pitch gating control on the spacecraft's orbital ground track drift.

As a result of the ground track drift maintenance program, Freon Useable Impulse declined at a lower rate as shown in Figures 4-1 and 4-2.

RMP2 commanded into operation shortly after ACS acquisition as the primary control of the Yaw subsystem has functioned normally.

Both Solar Array Drives (SAD) performed normally and maintained proper solar panel alignment with the sun line during satellite day. Motor voltages and temperatures are within specifications.

Typically, flywheel duty cycles have averaged seven percent of less. Pitch and Yaw flywheel speeds have averaged less than -150 RPM while the Roll Flywheels have averaged +760 RPM. Sun transient response due to dual scanner mode operation has been normal.

Tables 4-2, 4-3 and 4-4 show typical telemetry for temperatures and pressures; voltages and currents and attitude errors and driver duty cycles as obtained from SCEST program averages.

Table 4-1. Landsat-2 Pitch Position Bias Quarterly Pneumatic Gating Summary

Period		PPB Implementation Sequence			Duration Centered About Satellite Midnight (Minutes)	Resulting Average Number of Pitch Gates per Day
		Orbit Number				
From Orbits	To Orbits	N_o	N_o+1	N_o+2		
6040 (30 Mar 76)	6433 (28 Apr 76)	+2.9°	+2.9°	+2.9°	50	5 to 7 (-P)
6433 (28 Apr 76)	6447 (29 Apr 76)	+2.0°	+2.0°	+2.0°	50	0
6447 (29 Apr 76)	6837 (27 May 76)	+2.0°	+2.9°	+2.0°	50	4 to 5 (-P)
6837 (27 May 76)	6862 (28 May 76)	+2.0°	+2.0°	+2.0°	50	0 to 1 (-P)
6862 (28 May 76)	6934 (2 June 76)	+2.0°	+2.0°	+2.0°	10	3 to 5 (+P)
6934 (2 June 76)	7102 (15 June 76)	+2.0°	+2.0°	+2.0°	45	1 to 2 (+P)
7102 (15 June 76)	7214 (23 June 76)	+2.0°	+2.0°	+2.0°	40	3 to 4 (+P)
7214 (23 June 76)	7251 (25 June 76)	+2.0°	+2.0°	+2.0°	18	1 (+P)
7251 (25 June 76)	7409 (7 July 76)	+2.0°	+2.0°	+2.0°	50	0
7409 (7 July 76)	7640 (23 July 76)	+2.0°	+2.9°	+2.0°	50	2 (-P)

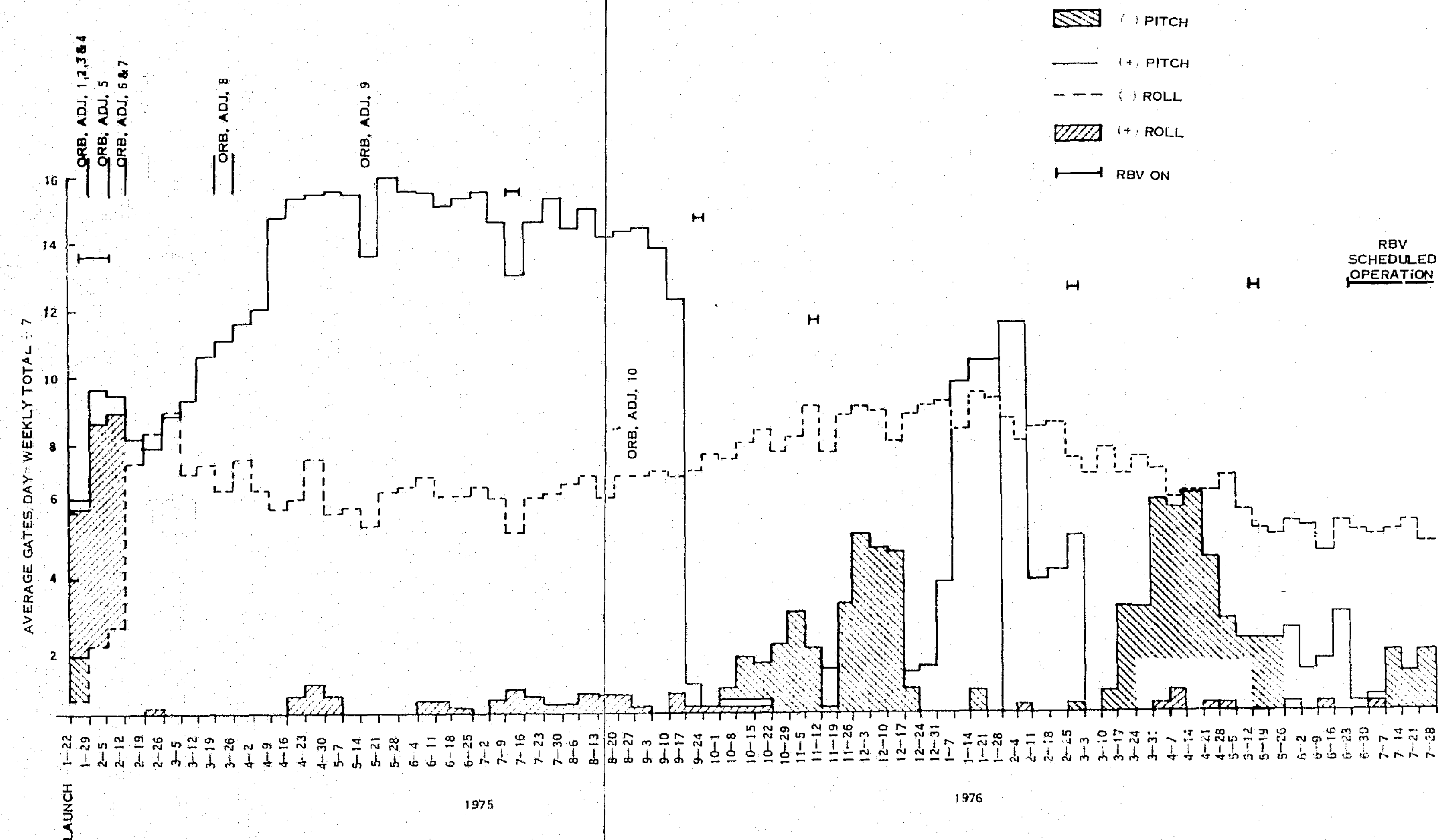


Figure 4-1. Landsat-2 Gating Frequency vs Time

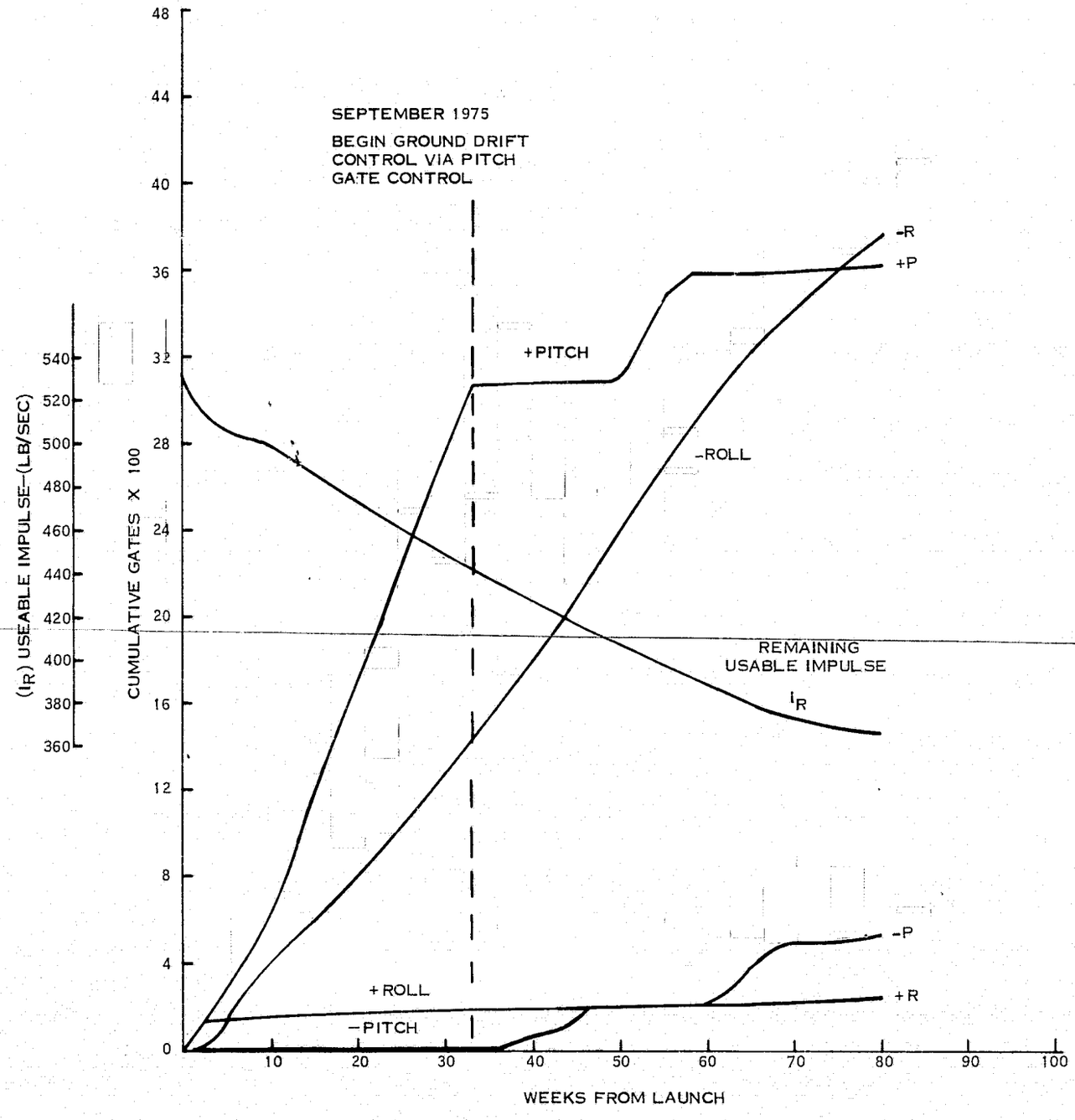


Figure 4-2. Landsat-2 Gating History

Table 4-2. Landsat-2 Subsystem Temperature and Pressure Averages

Function	Units	Orbits						
		29	2532	5102	6362	6761	7210	7641
1084 RMP 1 Gyro Temperature	DGC	19.33(1)	21.02	22.69	22.71	22.75	22.69	22.45
1094 RMP 2 Gyro Temperature	DGC	74.00	74.00	74.26	74.34	74.39	74.39	74.45
1222 SAD RT MTR HSNG Temp.	DGC	19.50	22.23	22.98	23.88	24.24	23.96	23.62
1242 SAD LT MTR HSNG Temp.	DGC	26.87	27.54	29.79	29.36	29.26	28.96	28.94
1223 SAD RT MTR WNDNG Temp.	DGC	21.76	24.23	24.36	25.62	26.20	25.84	25.23
1243 SAD LT MTR WNDNG Temp.	DGC	30.23	30.32	32.83	32.10	31.97	31.71	31.68
1228 SAD RT HSG Pressure	PSI	7.26	7.25	7.18	7.13	7.13	7.13	7.13
1248 SAD LT HSG Pressure	PSI	7.28	7.27	7.21	7.15	7.11	7.04	7.02
1007 FWD Scanner MTR Temp.	DGC	22.07	22.25	23.80	23.94	23.73	23.49	23.39
1016 Rear Scanner MTR Temp.	DGC	24.19	23.62	25.04	24.75	24.85	24.73	24.59
1003 FWD Scanner Pressure	PSI	9.59(2)	D	D	D	D	D	D
1012 Rear Scanner Pressure	PSI	6.21	6.00	5.62	5.46	5.46	5.36	5.35
1212 Gas Tank Pressure	PSI	1948.0	1672.12	1517.04	1432.58	1430.44	1405.77	1381.12
1210 Gas Tank Temperature	DGC	20.66	22.33	24.25	24.01	24.07	23.99	23.75
1213 Manifold Pressure	PSI	53.98	54.83	54.56	55.00	54.82	55.44	54.78
1211 Manifold Temperature	DGC	19.18	20.50	22.59	22.41	22.41	22.07	21.91
1059 CLG Power Supply Card Temp	DGC	39.00	39.52	41.47	41.19	41.02	40.72	40.71
1260 TH01 EBP	DGC	24.29	25.01	27.21	26.76	26.65	26.37	26.43
1261 TH02 EBP	DGC	20.29	21.36	23.25	23.14	23.06	22.77	22.79
1262 TH03 EBP	DGC	18.29	20.05	21.46	21.59	21.78	21.48	21.34
1263 TH01 STS	DGC	6.54	-6.22	0.52	-2.58	-3.09	-3.83	-2.62
1264 TH02 STS	DGC	D	D	D	D	D	D	D
1265 TH03 STS	DGC	8.46	-.48	8.67	5.49	4.17	3.31	5.75
1266 TH04 STS	DGC	-2.78	-9.65	-3.26	-4.21	-4.32	-4.97	-3.63
1267 TH05 STS	DGC	9.62	-2.64	5.57	1.97	1.19	.06	2.20
1224 SAD R FSST	DGC	35.00	36.57	35.81	39.80	42.48	42.72	40.86
1244 SAD L FSST	DGC	50.00	46.29	49.13	48.65	51.77	51.43	51.71

(1) RMP-1 Left off after initial test in Orbit 1
(2) Prelaunch leak - refer to text
D Defective telemetry point

Table 4-3. Landsat-2 ACS Voltages and Currents

Function	Units	Orbit						
		29	2532	5102	6362	6761	7210	7611
1081 RMP 1 MTR Volts	VDC	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1082 RMP 1 MTR Current	Amps	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1080 RMP 1 Supply Volts	VDC	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1091 RMP 2 MTR Volts	VDC	29.99	29.94	29.92	29.87	29.87	29.87	29.87
1092 RMP 2 MTR Current	Amps	0.10	0.10	0.10	0.10	0.10	.11	.11
1090 RMP 2 Supply Volts	VDC	-23.63	-23.61	-23.59	-23.59	-23.59	-23.58	-23.59
1220 SAD RT MTR WNDNG Volts	VDC	-5.47	-4.51	-4.47	-4.37	-4.34	-4.26	-4.22
1240 SAD LT MTR WNDNG Volts	VDC	-5.08	-4.70	-4.72	-4.66	-4.54	-4.61	-4.54
1227 SAD RT -15 VDC Conv	VDC	15.14	15.15	15.16	15.13	15.13	15.13	15.13
1247 SAD LT -15 VDC Conv	VDC	15.23	15.22	15.21	15.21	15.21	15.22	15.20
1056 CLB ± 6 VDC	TMV	2.35	2.35	2.38	2.38	2.38	2.38	2.38
1055 CLB ± 10 VDC	TMV	2.88	2.90	2.92	2.92	2.93	2.93	2.93
1057 CLB Power Supply Volts	TMV	2.97	2.94	2.96	2.96	2.96	2.97	2.96

Table 4-4. Landsat-2 ACS Attitude Errors and Driver Duty Cycles

Function	Units	Orbits						
		26	2532	5102	6362	6761	7210	7611
1041 Pitch Fine Error	DEG	-0.15	-0.14	-.13	-1.99	-1.52	-1.12	-1.18
1043 Pitch Flywheel Speed	RPM	-156.12	-198.41	-162.97	202.41	212.68	-146.25	214.14
1038 Pitch Mtr Drvr CCW	PCT	6.64	7.35	6.05	4.21	4.21	7.88	4.21
1039 Pitch Mtr Drvr CW	PCT	2.03	2.60	1.80	8.17	8.52	4.11	8.51
1030 Roll Fine Error	DEG	-0.13	-0.09	-.14	-.13	-.14	-.16	-.14
1027 Roll Rear Flywheel SPD	RPM	729.30	739.75	748.56	745.59	748.60	742.91	742.88
1026 Roll Fwd Flywheel SPD	RPM	703.02	725.23	735.81	723.65	730.26	708.57	721.06
1022 Roll Rear Mtr Drvr CCW	PCT	0.67	.39	.63	.47	.15	.32	.41
1025 Roll Rear Mtr Drvr CW	PCT	7.54	5.47	6.34	5.36	5.80	6.68	6.80
1023 Roll Fwd Mtr Drvr CCW	PCT	0.70	.37	.87	.55	.62	.55	.68
1024 Roll Fwd Mtr Drvr CW	PCT	5.46	4.74	4.01	4.60	3.57	4.28	3.82
1035 Yaw Tach	RPM	-95.73	-41.57	-38.16	-103.44	-55.73	-86.84	-11.06
1033 Yaw Mtr Drvr CW	PCT	1.98	1.77	2.01	1.67	1.78	1.57	1.76
1034 Yaw Mtr Drvr CCW	PCT	2.10	1.72	1.90	1.74	1.89	1.81	1.64
1221 SAD Right Tach	D/M	0.00	3.38	3.38	3.37	3.38	3.37	3.38
1241 SAD Left Tach	D/M	3.68	3.63	3.56	3.56	3.56	3.57	3.55

SECTION 5

COMMAND/CLOCK SUBSYSTEM (CMD)

The CMD Subsystem operated nominally in this report period.

Figure 5-1 shows the history of the S/C clock drift since launch. Figure 5-2 shows the cumulative clock drift, 6.5 seconds in 18 months, and Figure 5-3 gives drift rate of the S/C clock, an average of 0.82 MS/orbit. The clock of Landsat-2 drifts in opposite direction from the clock of Landsat-1.

Table 5-1 shows typical telemetry values since launch. All are nominal.

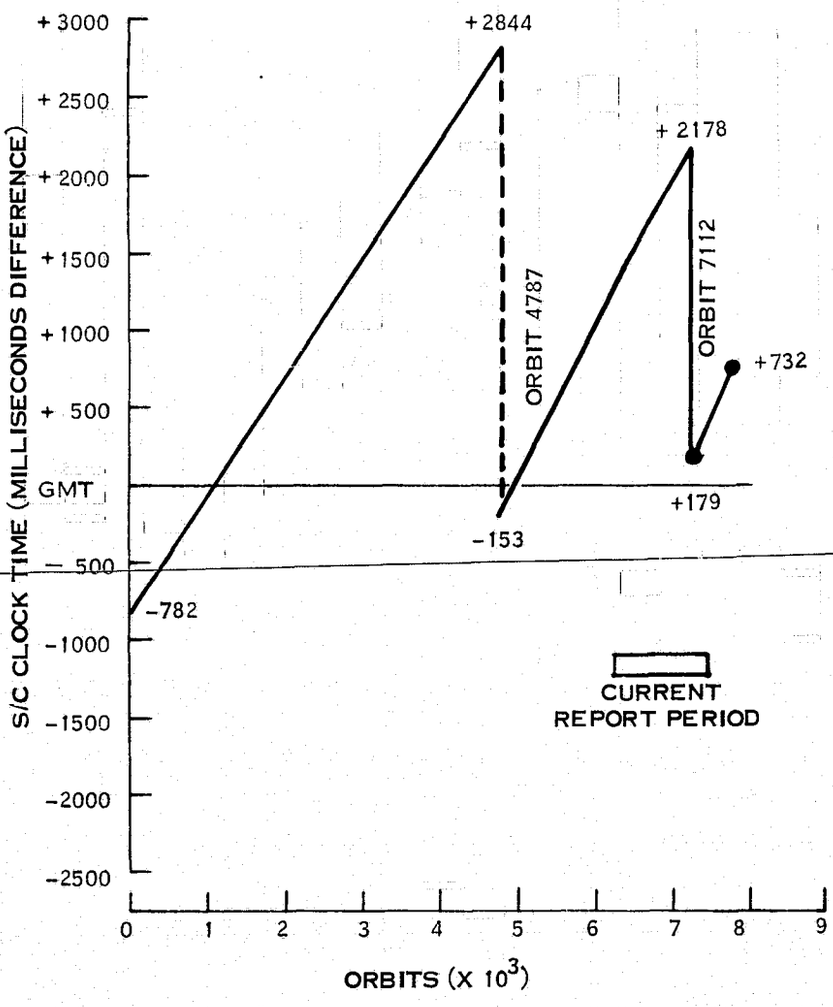


Figure 5-1. Landsat-2 Drift History

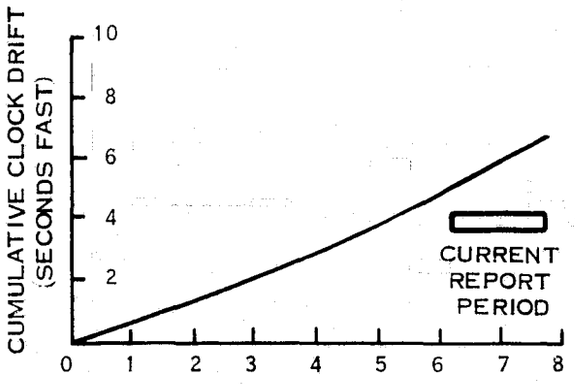


Figure 5-2. Cumulative Clock Drift

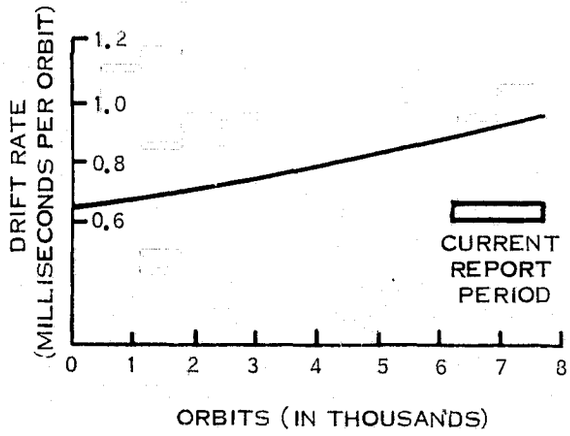


Figure 5-3. Drift Rate of S/C Clock

Table 5-1. Command/Clock Telemetry Summary, Landsat-2

Function No.	Name	Mode	Units	Orbit						
				35	2462	5091	6362	6761	7210	7641
8005	Pri. Power Supply Temp	-	DGC	38.82	40.43	39.43	39.60	40.18	40.06	39.94
8006	Red. Power Supply Temp	-	DGC	36.93	38.70	38.00	38.31	38.83	38.66	38.52
8007	Pri. Osc. Temp	-	DGC	28.70	29.35	28.70	28.70	28.70	28.70	28.69
8008	Red Osc. Temp	-	DGC	27.82	28.68	27.26	27.33	27.87	27.77	27.60
8009	Pri. Osc. Output	-	TMV	1.06	1.06	1.05	1.05	1.06	1.06	1.05
8010	Red. Osc. Output	-	TMV	1.17	1.20	1.18	1.19	1.19	1.19	1.19
8011	100 KHz	Pri. - Red	TMV	3.17	3.16	3.15	3.15	3.15	3.15	3.15
8012	10 KHz	Pri. - Red	TMV	3.08	3.05	3.05	3.05	3.05	3.05	3.05
8013	2.5 KHz	Pri. - Red	TMV	3.01	2.95	2.95	2.95	2.95	2.95	2.95
8014	400 Hz	Pri. - Red	TMV	4.17	4.45	4.45	4.45	4.45	4.45	4.45
8015	Pri. +4V Power Supply	Pri. Clk ON	VDC	NA	2.05	2.05	2.05	2.05	2.05	2.05
8016	Red. +4V Power Supply	Red Clk ON	VDC	NA	2.01	2.00	2.00	2.00	2.00	2.00
8017	Pri. +6V Power Supply	Pri. Clk ON	VDC	NA	2.30	2.30	2.30	2.30	2.30	2.30
8018	Red. +6V Power Supply	Red Clk ON	VDC	NA	2.31	2.30	2.30	2.30	2.30	2.30
8019	Pri. - 6V Power Supply	Pri. Clk ON	VDC	NA	5.23	5.23	5.23	5.23	5.23	5.22
8020	Red. - 6V Power Supply	Red. Clk ON	VDC	NA	5.23	5.23	5.23	5.23	5.23	5.23
8021	Pri. - 23V Power Supply	Pri. Clk ON	VDC	NA	5.70	5.70	5.70	5.70	5.70	5.70
8022	Red - 23V Power Supply	Red Clk ON	VDC	NA	5.65	5.65	5.65	5.65	5.65	5.65
8023	Pri. - 29V Power Supply	Pri. Clk ON	VDC	NA	5.30	5.29	5.29	5.29	5.29	5.29
8024	Red - 29V Power Supply	Red Clk ON	VDC	NA	5.29	5.29	5.29	5.29	5.29	5.29
8101	CIU A - 12V	CIU A ON	VDC	3.79	3.97	3.97	3.97	3.97	3.97	3.96
8102	CIU B - 12V	CIU B ON	VDC	3.78	3.95	3.95	3.95	3.95	3.95	3.95
8103	CIU A - 5V	CIU A ON	VDC	3.93	4.15	4.15	4.14	4.14	4.14	4.14
8104	CIU B - 5V	CIU B ON	VDC	3.90	4.10	4.10	4.10	4.10	4.10	4.10
8105	CIU A Temp	CIU A ON	DGC	26.01	22.50	21.67	21.50	21.68	21.56	21.62
8106	CIU B Temp	CIU B ON	DGC	23.35	20.38	19.70	19.52	19.72	19.56	19.65
8201	Receiver RF-A Temp	-	DGC	NA	30.02	29.14	29.10	29.67	29.64	29.22
8202	Receiver RF-B Temp	-	DGC	29.09	F	F	F	24.01	24.00	24.04
8203	D MOD A Temp	-	DGC	28.95	39.20	38.56	38.19	39.30	39.57	39.08
8204	D MOD B Temp	-	DGC	37.73	27.56	26.72	26.66	27.92	27.83	28.11
8205	Receiver A AGC	Receiver A ON	DGC	F	-92.18	-91.43	-93.02	-89.62	-89.82	-89.95
8206	Receiver B AGC	Receiver B ON	DBM	-87.83	F	F	F	**	**	-88.16
8207	Amp. A Output	Receiver A ON	TMV	F	2.51	2.54	2.55	2.68	2.68	2.58
8208	Amp. B Output	Receiver B ON	TMV	2.10	F	F	F	**	**	2.51
8209	Freq. Shift Key A Out	Receiver A ON	TMV	F	1.08	1.08	1.08	1.10	1.08	1.08
8210	Freq. Shift Key B Out	Receiver B ON	TMV	1.11	F	F	F	**	**	1.13
8211	Amp. A Output	Receiver A ON	TMV	F	1.12	1.13	1.12	1.12	1.12	1.11
8212	Amp. B Output	Receiver B ON	TMV	1.13	F	F	F	**	**	1.16
8215	D MOD A - 15V	Receiver A ON	TMV	F	4.87	4.87	4.87	4.87	4.87	4.87
8216	D MOD B - 15V	Receiver B ON	TMV	4.77	F	F	F	**	**	4.77
8217	Regulator A - 10V	Receiver A ON	TMV	F	5.40	5.40	5.40	5.40	5.40	5.40
8218	Regulator B - 10V	Receiver B ON	TMV	5.32	F	F	F	**	**	5.31
8311	ECAM Mem. Tmp	ECAM ON	DGC	NA	18.03	18.41	18.66	18.24	18.11	18.10
8312	ECAM Pwr Spply Temp	ECAM ON	DGC	NA	23.13	23.13	23.32	22.61	22.49	22.15

NA - Not available due to processing problem - MT 710
F - OFF

SECTION 6

TELEMETRY SUBSYSTEM (TLM)

The TLM has operated nominally in this report period.

Table 6-1 shows typical telemetry values since launch. All are nominal except for functions 1264 (Thermal Shield 5 Temperature), 4002 (MMCA Board 2 Temperature), and 13200 (APU 24 Volt Input), which were defective before launch. Verification of these functions is acceptable by adjacent temperature and downstream voltage measurements respectively.

The memory section of the telemetry matrix remains in the 0.0 mode.

Table 6-1. Landsat-2 TMP Telemetry Values

Func. No.	Function Name	Unit	Orbit						
			35	2467	5091	6362	6761	7210	7641
9001	Memory Sequencer A Converter	VDC	4.45	4.45	4.45	4.45	4.45	4.45	4.45
9002	Memory Sequencer B Converter	VDC	**	**	**	**	**	**	**
9003	Memory Sequencer Temp	°C	20.00	20.77	21.37	20.87	19.79	19.57	20.46
9004	Formatter A Converter	VDC	4.52	4.51	4.52	4.51	4.52	4.51	4.50
9005	Formater B Converter	VDC	**	**	**	**	**	**	**
9006	Dig. Mux A Converter	VDC	4.22	4.22	4.22	4.22	4.22	4.21	4.21
9007	Dig. Mux B Converter	VDC	**	**	**	**	**	**	**
9008	Formatter/Dig Mux Temp	°C	25.00	23.98	27.80	24.75	24.41	23.54	22.51
9009	Analog Mux A Converter	VDC	4.02	4.05	4.05	4.05	4.05	4.05	4.05
9010	Analog Mux B Converter	VDC	**	**	**	**	**	**	**
9011	A/D Converter A Voltage	VDC	4.02	4.02	4.03	4.04	4.03	4.03	4.04
9012	A/D Converter B Voltage	VDC	**	**	**	**	**	**	**
9013	Analog Mux, A/D Conv. Temp	°C	25.00	24.91	27.33	25.68	24.79	24.61	25.00
9014	Preregulator A Voltage	VDC	4.00	4.00	4.00	4.00	4.00	4.00	4.00
9015	Preregulator B Voltage	VDC	**	**	**	**	**	**	**
9016	Reprogrammer Temp	°C	22.50	22.27	24.74	22.30	22.26	21.83	21.89
9017	Memory A Converter	VDC	4.45	4.45	4.45	4.45	4.45	4.45	4.45
9018	Memory A Temp	°C	17.50	17.33	17.17	16.92	15.75	15.96	15.62
9019	Memory B Converter	VDC	**	**	**	**	**	**	**
9020	Memory B Temp	°C	17.50	17.28	17.41	17.29	16.71	16.49	17.45
9100	Reflected Power (Xmtr A)	dBm	18.29	13.68	14.18	13.83	13.76	13.76	13.88
9101	Xmtr A-20 VDC	VDC	3.80	3.98	3.97	3.97	3.97	3.97	3.97
9103	Xmtr A Temp	°C	27.73	20.97	26.40	21.51	20.89	20.80	21.06
9104	Xmtr B Temp	°C	*	22.07	27.74	22.60	21.98	21.86	22.13
9105	Xmtr A Power Output	dBm	27.73	26.19	26.29	26.19	26.19	26.19	26.19
9106	Xmtr B Power Output	dBm	**	**	**	**	**	**	**

* Not available due software
** Not turned on since Prelaunch

SECTION 7

ORBIT ADJUST SUBSYSTEM (OAS)

The Orbit Adjust Subsystem on Landsat-2 has been fired ten times since launch, 6 times using the -X thruster and 4 times using the +X thruster. One firing of the -X and +X thruster each was for alignment tests. Three +X firings and two -X firings were made to phase the satellite with Landsat-1 to obtain a combined nine day ground track repeat pattern. Three -X firings were for orbit maintenance.

No firing of the OAS was made during this report period (See Section 2 also).

The Subsystem activity since launch is summarized in Table 7-1. A total of 6.87 lbs. of hydrazine has been expended so far from the pre-launch load of 67 lbs.

The OAS telemetry has consistently shown normal pressure temperature parameters. A sampling of the same is given in Table 7-2. The variations in the thrust chamber temperatures in Table 7-2 are consistent with the variations in sun intensity and sun angle.

Table 7-1. Landsat-2 Orbit Adjust Summary

Orbit	Orbit Adjust No.	Ignition Epoch	Burn Duration (Seconds)	$+\Delta a$ (Meters)	Engine Performance Efficiency %	Fuel[1] Used (Lbs)	Tank Pressure (PSIA)	Tank Temperature (° F)	Thruster Axis
32	1	25 Jan 75 00 34 00.8	4.8	39	104.3	0.02	539.96	72.0	-X
71	2	27 Jan 75 19 57 00.8	4.8	-36	90.1	0.02	547.46	73.5	+X
79	3	28 Jan 75 09 49 00.8	420.0	3455	107.0	1.62	547.46	73.5	-X
86	4	28 Jan 75 21 13 00.8	420.0	3233	107.0	1.51	502.46	73.5	-X
163	5	3 Feb 75 10 36 00.8	420.0	-2974	97.0	1.42	468.75	75.0	+X
191	6	5 Feb 75 10 51 00.8	360.0	-2421	97.5	1.15	438.71	75.0	+X
212	7	6 Feb 75 22 31 00.8	308.8	-2009	98.6	0.95	416.21	75.0	+X
880	8	26 Mar 75 21 44 00.8	12.8	82	107.6	0.04	397.47	70.5	-X
1632	9	19 May 75 18 54 00.8	24.0	+154	107.6	0.07	401.21	73.5	-X
2958	10	22 Aug 75 22 11 58.8	22.0	146	110.3	0.07	404.96	73.5	-X

[1] Initial Fuel Capacity - 67 lbs.

Table 7-2. Landsat-2 OAS Telemetry Values

Function No.	Name	Units	Orbit						
			50	2532	5102	6362	6761	7210	7641
2001	Prop. Tank Temp.	°C	23.03	23.05	23.89	23.05	22.63	22.22	22.22
2003	Thrust Chamber No. 1 (-X) Temp.*	°C	24.84	30.14	25.12	29.18	30.93	30.90	28.57
2004	Thrust Chamber No. 2 (+X) Temp.*	°C	37.34	38.41	38.55	39.50	39.54	39.12	39.29
2005	Thrust Chamber No. 3 (-Y) Temp.*	°C	47.22	34.20	46.35	36.53	33.97	33.61	34.82
2006	Line Pressure	psia	545.60	404.97	413.25	414.12	414.17	414.08	415.39

*Widespread of temperature is due to nozzle locations and satellite day/night transitions relative to data averaged. Typical orbital range is from 19 to 59 DGC.

SECTION 8

MAGNETIC MOMENT COMPENSATING ASSEMBLY (MMCA)

The Spacecraft was corrected for unbalanced magnetic moments in Orbits 293 and 321 as reported earlier. These adjustments were made on the pitch magnetic rod of the MMCA.

No adjustment to the MMCA dipoles was made during this report period.

Orbital averages of MMCA telemetry functions for selected orbits are given in Table 8-1.

Table 8-1. Landsat-2 MMCA Telemetry Values

Function	Name	Units	Orbit						
			50	2532	5102	6362	6761	7210	7641
4001	A1 Board Temp	°C	20.56	19.82	19.47	19.41	19.35	19.22	19.20
4002	A2 Board Temp	°C	*	*	*	*	*	*	*
4003	Hall Current	TMV	3.40	3.40	3.40	3.40	3.40	3.40	3.40
4004	Yaw Flux Density	TMV	3.05	3.07	3.07	3.06	3.07	3.07	3.07
4005	Pitch Flux Density	TMV	3.15	2.90	2.90	2.90	2.90	2.90	2.90
4006	Roll Flux Density	TMV	2.99	2.98	2.97	2.97	2.97	2.97	2.97

*Defective Telemetry Function (Pre-Launch)

SECTION 9

UNIFIED S-BAND/PREMODULATION PROCESSOR (USB/PMP)

The USB Subsystem has operated nominally in this report period.

Table 9-1 shows telemetry values since launch. All are nominal. The transmitter has maintained a steady indicated power output of about 1.4 watts since launch. Figure 9-1 shows AGC readings of Goldstone for a constant position in space. The scatter of data points reflect variations in the ground station calibration and readout.

Table 9-1. Landsat-2 USB/PMP Telemetry Values

				ORBITS						
No.	Function Name	Units	T/V (20°C)	15	2462	5091	6362	6761	7210	7641
11001	USB Rcvr AGC	DBM	NA	-112.72	-128.8	-124.29	-131.50	-128.46	-123.39	-122.37
11002	USB Xmtr Pwr	WTS	1.40	1.36	1.43	1.38	1.37	1.37	1.40	1.37
11003	USB Rcvr Error	KHz	NA	-2.15	-4.64	-2.97	-4.05	-3.41	-3.96	-4.30
11004	USB Xpond Temp	DGC	22.93	25.88	24.37	27.49	24.60	24.46	24.44	24.12
11005	USB Xpond Press	PSI	16.99	17.08	16.74	16.49	16.19	16.06	15.95	15.94
11007	USB Xmtr A -15V	VDC	2.35	2.36	F	F	F	F	F	F
11008	USB Xmtr B -15V	VDC	2.39	F	2.40	2.42	2.40	2.39	2.45	2.39
11009	USB Range -15V	VDC	2.07	2.07	2.07	2.06	2.05	2.05	2.05	2.05
11101	PMP Pwr A Volt	VDC	-15.22	-15.10	F	F	F	F	F	F
11102	PMP Pwr B Volt	VDC	-15.07	F	-15.02	-14.99	15.01	-14.99	-14.98	-14.99
11103	PMP Temp A	DGC	NA	37.30	29.12	34.67	29.61	28.77	28.52	28.36
11104	PMP Temp B	DGC	NA	28.34	30.57	36.08	31.03	30.39	30.19	29.62

F Unit OFF in this period.

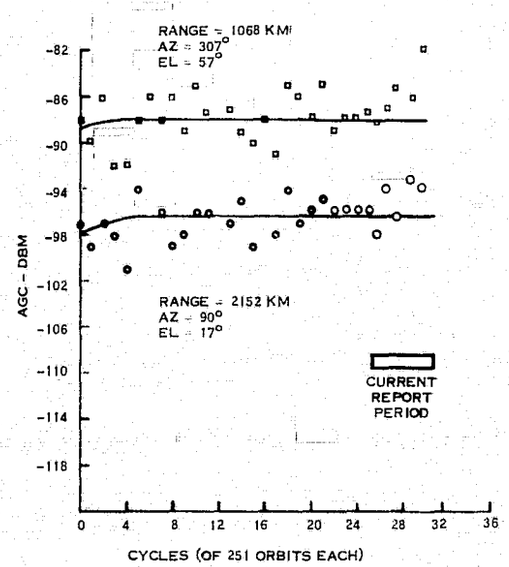


Figure 9-1. USB (Link 4) AGC Readings at Goldstone with 30' Antenna, Landsat-2

SECTION 10

ELECTRICAL INTERFACE SUBSYSTEM (EIS)
LANDSAT-2

The Auxiliary Processing Unit (APU) consisting of Search Track Data, Time Code Data, and Back-up Timers operated satisfactorily throughout this report period. Telemetry for the APU is shown in Table 10-1.

Table 10-1. Landsat-2 APU Telemetry Functions

Function	Description	Unit	Orbit						
			21	2532	5102	6362	6761	7210	7641
13200	APU, -24.5 VDC	TM	*	*	*	*	*	*	*
13201	APU, -12 Volts	TMV	2.42	2.45	2.45	2.45	2.45	2.45	2.45
13202	APU Temp	DGC	27.44	26.60	27.70	26.37	26.27	26.17	26.21

* Defective Telemetry (Prelaunch)

The Power Switching Module (PSM) containing the switching relays for power to the OAS, MSS, WBVTR No. 1 and No. 2, RBV and PRM, functioned normally. During this report period, the MSS as well as WBVTR No. 2 power circuits, have been operated on a regular basis. RBV power circuits have been operated during the periodic tests on 1, 2 and 3 March 1976.

The Interface Switching Module performed all switchings normally during this report period.

SECTION 11

THERMAL SUBSYSTEM (THM)

The Thermal Control Subsystem on Landsat-2 has provided excellent temperature control of all spacecraft equipments since launch.

Table 11-1 gives average subsystem telemetry values for several representative orbits during the last eighteen months of operation of Landsat-2. Average temperatures of the sensory ring bays are plotted in Figure 11-1.

During this report period, the sun intensity varied from 0.989 to 0.969 of the mean value and the average spacecraft temperatures remained more or less constant. However, temperatures are expected to increase in the on-coming period of higher sun intensity.

During orbit 6735 (17 May 1976) the compensation load configuration was switched from 3, 4, 8 ON to 2, 3, 6 ON. This was done to reduce the temperature gradient among batteries. A history of compensation load switchings since launch is given in Table 11-2.

Table 11-1. Landsat-2 Thermal Subsystem Analog Telemetry (Average Value for Frames of Data Received in NBTR Playback)

Function No.	Function Description	Unit	Orbits						
			21	2532	5102	6362	6761	7210	7641
7001	THM TH01 STI	DGC	19.40	19.59	19.97	19.44	18.56	18.51	18.63
7002	THM TH02 SBO	DGC	17.18	18.05	17.47	17.87	17.48	17.71	17.21
7003	THM TH03 STI	DGC	18.73	19.49	18.50	18.77	18.30	18.62	17.73
7004	THM TH10 TCB	DGC	19.38	19.01	19.34	18.50	18.76	18.68	18.64
7005	THM TH04 STI	DGC	17.19	17.92	16.76	17.19	17.12	17.54	16.30
7006	THM TH05 SBO	DGC	17.42	17.46	16.68	17.07	16.85	17.01	16.52
7007	OA-X Thruster	DGC	19.66	20.58	19.65	20.01	20.40	20.29	20.02
7008	THM TH06-STO	DGC	14.78	14.77	13.94	14.14	14.00	14.03	13.78
7009	THM TH06 SBI	DGC	19.18	18.18	18.41	18.49	18.28	18.24	18.06
7010	THM TH07 STI	DGC	18.08	18.26	17.44	17.54	17.85	17.81	17.56
7011	THM TH08 STO	DGC	19.34	20.22	19.23	19.65	20.12	20.08	19.74
7012	THM TH09 SBI	DGC	21.44	21.80	20.93	20.75	20.91	20.80	20.68
7013	THM TH10 SBO	DGC	18.58	18.56	18.39	18.13	18.17	18.10	18.05
7014	THM TH11 STI	DGC	21.65	21.13	21.93	20.64	20.73	20.58	20.61
7015	THM TH12 SBO	DGC	23.93	22.13	24.68	22.29	21.82	21.79	21.83
7016	THM TH13 STI	DGC	22.21	20.51	23.62	20.66	20.35	20.19	20.21
7017	RBV Beam Ctr Ln	DGC	20.38	20.33	19.92	19.16	19.21	19.07	19.09
7018	THM TH14 STO	DGC	24.12	21.29	26.43	21.99	21.24	21.09	21.40
7019	NBR Rad Outbd B4	DGC	2.72	3.26	2.93	2.85	2.56	2.48	2.31
7020	THM TH15 SBI	DGC	23.07	21.13	25.56	21.91	20.83	20.52	20.11
7021	THM TH16 STI	DGC	23.26	22.29	25.46	22.79	21.47	21.20	21.07
7022	THM TH17 SBI	DGC	21.77	21.22	23.74	21.79	20.15	20.03	20.21
7023	THM TH18 SBO	DGC	21.67	21.49	23.36	22.12	20.90	20.82	21.30
7030	THM TH03 Bur	DGC	15.50	16.28	15.14	15.81	15.82	16.19	15.21
7033	THM TH12 Bur	DGC	23.05	21.70	24.59	22.00	21.58	21.52	21.44
7035	THM TH18 Bur	DGC	19.53	19.32	20.39	19.50	18.90	18.80	19.05
7040	THM TH01 TCB	DGC	19.42	19.78	19.72	19.58	18.89	19.01	18.82
7041	THM TH02 TCB	DGC	17.55	18.02	17.39	17.74	17.33	17.49	17.06
7042	THM TH03 TCB	DGC	16.85	18.23	16.32	17.40	17.69	18.59	16.37
7043	THM TH04 TCB	DGC	19.90	20.05	19.33	19.73	19.61	19.82	19.21
7044	THM TH05 TCB	DGC	16.42	16.21	15.75	15.94	15.73	15.75	15.47
7045	THM TH07 TCB	DGC	17.76	18.12	17.33	17.52	17.97	18.00	17.64
7046	THM TH09 TCB	DGC	19.30	19.31	18.81	18.71	18.81	18.69	18.83
7048	THM TH11 TCB	DGC	23.27	22.45	23.74	22.25	22.17	22.06	22.07
7049	THM TH12 TCB	DGC	23.04	20.62	23.94	20.85	20.49	20.38	20.34
7050	THM TH13 TCB	DGC	22.89	20.34	24.67	20.76	20.46	20.35	20.46
7051	THM TH14 TCB	DGC	25.07	22.11	27.69	22.92	22.11	21.88	22.22
7052	THM TH16 TCB	DGC	22.22	21.59	24.29	22.32	21.24	21.24	20.64
7053	THM TH17 TCB	DGC	23.52	22.79	24.86	23.31	22.05	21.91	22.53
7054	THM TH18 TCB	DGC	20.01	20.05	20.99	20.83	19.74	19.66	20.27
7060	THM Shutter By 1	DEG	22.54	24.43	26.65	22.56	15.51	16.28	15.42
7061	THM Shutter By 2	DEG	19.34	24.75	21.13	21.82	17.80	16.45	17.50
7062	THM Shutter By 3	DEG	22.75	31.67	11.99	23.52	25.26	31.72	12.70
7063	THM Shutter By 4	DEG	33.89	36.32	33.00	33.16	33.19	32.93	33.02
7064	THM Shutter By 5	DEG	7.50	8.67	2.90	2.89	2.93	2.93	2.88
7065	THM Shutter By 7	DEG	17.06	22.52	14.11	13.64	19.52	18.75	18.98
7067	THM Shutter By 9	DEG	33.75	38.22	34.12	32.97	34.23	34.19	33.75
7068	THM Shutter By 10	DEG	37.46	34.96	37.09	32.71	33.91	33.40	33.32
7069	THM Shutter By 11	DEG	52.25	10.16	17.39	8.74	1.36	0.50	3.29
7070	THM Shutter By 12	DEG	61.38	46.20	67.16	48.10	46.44	45.49	45.57
7071	THM Shutter By 13	DEG	63.60	45.76	74.14	50.24	47.73	46.36	47.35
7072	THM Shutter By 14	DEG	59.44	40.40	72.14	45.11	39.93	37.70	40.22
7073	THM Shutter By 15	DEG	67.79	53.78	82.12	62.35	56.16	53.70	48.88
7074	THM Shutter By 16	DEG	45.20	43.68	61.13	49.30	41.77	41.43	36.55
7075	THM Shutter By 17	DEG	57.88	52.10	67.62	55.58	46.18	44.72	50.12
7076	THM Shutter By 18	DEG	40.49	39.32	45.84	44.18	36.89	36.00	40.47
7080	THM Q1 T Zener V	VDC	4.85	4.85	4.85	4.85	4.85	4.85	4.85
7081	THM Q2 T Zener V	VDC	4.90	4.90	4.90	4.90	4.90	4.90	4.90
7082	THM Q3 T Zener V	VDC	5.05	5.04	5.05	5.04	5.03	5.03	5.04
7083	THM Q1 S Zener V	VDC	4.97	4.96	4.96	4.95	4.95	4.95	4.95
7084	THM Q2 S Zener V	VDC	4.98	4.98	4.99	4.98	4.98	4.98	4.98
7085	THM Q3 S Zener V	VDC	5.15	5.15	5.15	5.15	5.15	5.15	5.15
7090	THM PSM Mount	DGC	21.02	21.05	21.71	20.18	19.86	19.57	19.63
7091	THM Ind Attitude	DGC	17.79	17.86	17.24	17.17	16.88	16.75	16.55
7092	THM RBV Radiator	DGC	18.01	18.06	16.24	15.12	14.58	14.45	14.46
7093	THM RBVC Ctr Bm	DGC	20.74	20.82	19.31	18.42	18.10	17.92	17.95
7094	THM WBVTR Root	DGC	13.77	14.71	15.72	14.64	12.03	11.91	11.86
7095	THM WBVTR Rad Ct	DGC	3.64	4.99	5.55	5.21	3.32	3.33	3.24
7096	THM WBVTR Strap	DGC	15.90	16.95	17.63	16.76	13.61	13.59	13.48
7097	THM WB Mt Bay 1	DGC	22.91	22.60	22.49	20.95	21.21	21.03	21.29
7098	THM WB Mat Bay 1	DGC	22.07	19.25	20.14	18.15	18.53	17.94	18.71
7099	THM WBVTR Sep 3	DGC	18.03	18.76	18.12	18.12	17.13	17.38	16.69
7100	THM WBVTR Sep 17	DGC	21.83	21.55	23.51	21.76	19.97	19.86	19.96
7101	THM WBVTR 1 Cent	DGC	22.45	23.13	23.78	22.79	18.70	18.73	18.59
7102	THM WBVTR 2 Bay	DGC	17.34	17.69	17.29	17.17	16.55	16.62	16.15
7103	THM WBVTR 2 By 16	DGC	21.77	20.99	23.87	21.21	19.50	19.15	19.11
7104	THM WBVTR 2 Ctr	DGC	20.74	21.08	22.34	20.64	17.92	17.64	17.73
7105	THM NBTR B Sep 6	DGC	17.82	17.96	17.86	17.35	16.89	16.49	16.61
7106	THM NBTR B Sep 1	DGC	22.11	20.70	23.85	20.75	19.96	19.67	19.82
7107	THM NBTR Bm Ctr	DGC	20.32	20.44	21.21	19.58	18.63	18.36	18.38
7108	THM MSS Mount 14	DGC	20.59	19.40	22.86	19.87	18.51	18.30	18.20
7109	THM OA - Y Thruster	DGC	25.64	21.99	27.51	22.86	21.76	21.49	21.88
7110	THM MSS WBVTR Bm	DGC	16.75	17.54	18.21	17.31	15.26	15.07	14.97
7111	THM OA +X Thruster	DGC	20.33	19.72	20.43	19.16	19.19	18.87	19.28
7130	THM Aux P1 T	DGC	34.18	6.21	29.67	6.53	5.52	4.17	8.42
7131	THM Aux P2 T	DGC	2.90	2.22	6.97	19.96	11.29	0.42	22.95

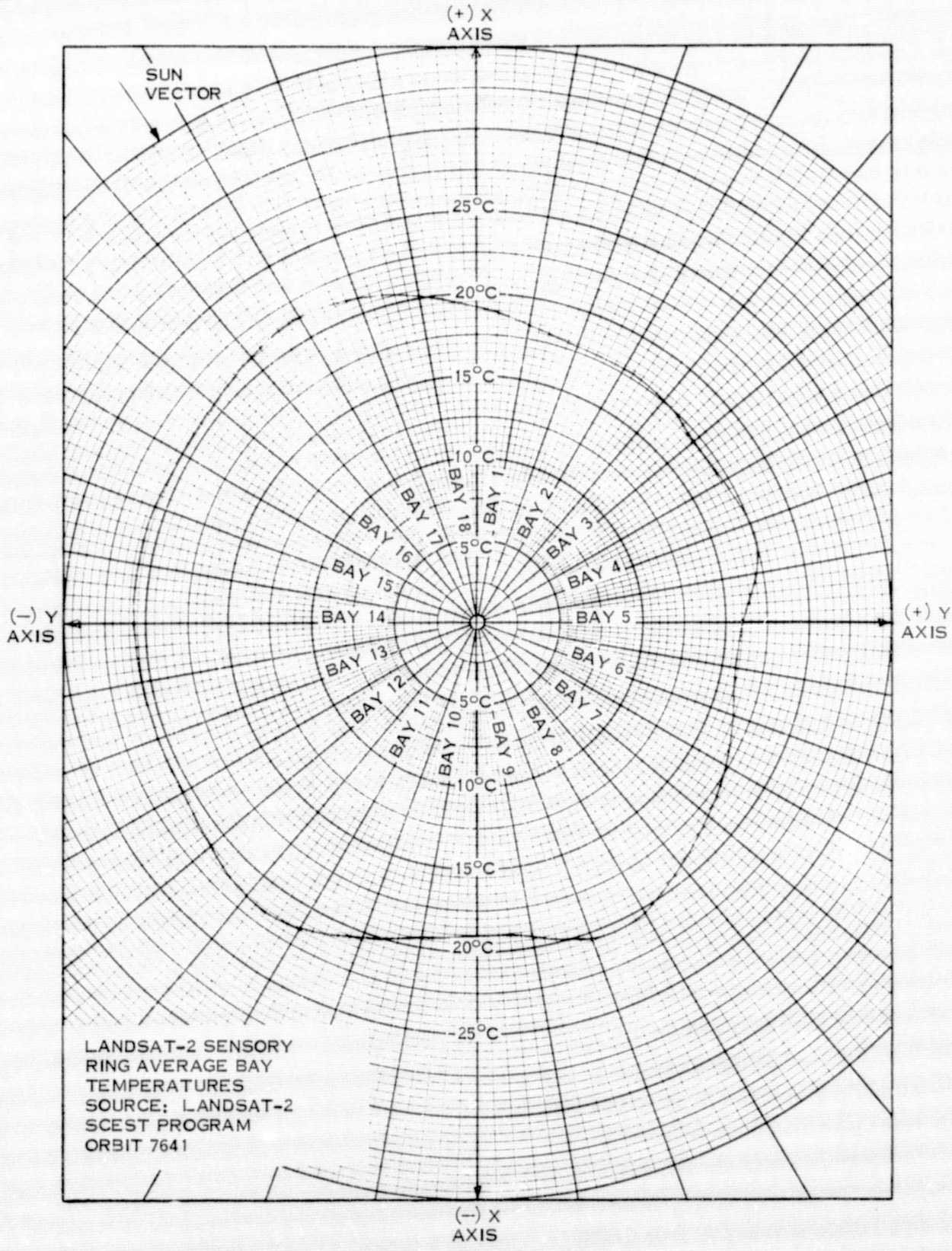


Figure 11-1. Landsat-2 Sensory Ring Thermal Profile

Table 11-2. Landsat-2 Compensation Load History

Orbits	Compensation Load Status*							
	1	2	3	4	5	6	7	8
Launch	0	0	0	0	0	0	0	0
2	X	X	X	X	X	0	X	X
237	X	X	X	X	X	0	0	0
272	X	X	X	X	X	0	X	X
306	X	X	0	X	X	0	0	0
572	X	X	0	X	X	0	0	X
1367	X	X	X	X	X	0	0	X
1645	X	X	0	X	X	0	0	X
1657	X	X	X	X	X	0	0	X
4202	0	0	X	X	0	0	0	0
4372	0	0	X	X	0	0	0	X
6735	0	X	X	0	0	X	0	0

* Note

X = ON
0 = OFF

SECTION 12

NARROWBAND TAPE RECORDERS (NBR)

The Narrowband Recorder Subsystem operated satisfactorily throughout the entire period, both Recorders alternating in Record and Playback modes with a nominal one minute overlap.

Since launch, each Recorder has operated for a period of 6898 hours.

Table 12-1 identifies cumulative operating hours for both Recorders by mode, and Table 12-2 gives typical telemetry values.

Table 12-1. NBR Operating Hours by Modes

NBR	On	Off	Playback	Record
A	6898	6252	272	6626
B	6898	6252	272	6626

Table 12-2. Narrowband Tape Recorder Telemetry Values, Landsat-2

Function		Typical Telemetry Values - Orbits							
No.	Name	6	3750-3751	10862	15256	17684	19523	19931	20375
10001	A - Motor Cur. (ma)								
	Record	190.10	189.20	186.31	192.63	195.8	194.10	187.60	196.20
	P/B	180.00	178.69	180.00	N.A.	N.A.	186.30	181.57	192.60
10101	B - Motor Cur. (ma)								
	Record	193.26	193.04	198.95	198.95	*	*	*	*
	P/B	188.18	185.44	187.89	202.1	*	*	*	*
10002	A - Pwr Sup. Cur. (ma)								
	Record	320.56	338.20	339.81	343.24	339.81	337.10	340.00	343.20
	P/B	535.78	568.38	567.75	N.A.	N.A.	559.40	562.80	572.90
10102	B - Pwr Sup. Cur. (ma)								
	Record	317.62	336.05	350.00	346.75	*	*	*	*
	P/B	570.78	553.63	567.50	580.51	*	*	*	*
10003	A - Rec. Temp. (DGC)	25.47	34.40	23.60	22.00	21.20	21.00	23.00	20.80
10103	B - Rec. Temp. (DGC)	24.58	23.41	23.41	23.18	19.54	18.40	18.40	18.40
10004	A - Supply (VDC)	-24.47	-24.44	-24.62	-24.62	-24.62	-24.60	-24.60	-24.60
10104	B - Supply (VDC)	-24.44	-24.51	-24.29	-24.57	-24.71	-24.70	-24.70	-24.70

N.A. - Data not available
* - No data. NBR-B out of service

SECTION 13

WIDEBAND TELEMETRY SUBSYSTEM (WBTS)

The WBTS has operated nominally in this report period.

Table 13-1 shows typical telemetry values. All are nominal.

Figure 13-1 is the AGC history recorded at Goldstone with the spacecraft successively at the same points in space. The scatter of data points reflect variations in the ground station calibration and readout. WBPA-2 has been used more consistently and is presented in this Figure. Values from WBPA-1 are nearly identical when this power amplifier is used.

Table 13-1. Wideband Telemetry Subsystem

(1)	Name	T/V 20W	Orbit 47	2462	5091	6362	6672	7431	7501
12001	Temp TWT Coll. (DGC)	33.6	34.38	35.00	F	F	31.88	32.50	35.63
12101		31.2	30.00	37.14	32.16	31.87	28.75	24.38	26.69
12002	Cur. Helix (MA)	3.85	4.29	4.51	F	F	4.05	4.13	4.06
12102		4.56	4.41	4.48	4.59	4.68	4.79	4.65	4.63
12003	Cur. Cath (MA)	46.10	46.04	45.12	F	F	43.00	45.12	45.05
12103		46.78	46.42	45.24	46.00	45.74	45.85	45.54	44.66
12004	Fwd Pwr (DBM)	42.68	42.83	42.77	F	F	42.41	42.74	42.78
12104		43.71	43.81	43.69	43.61	43.70	43.73	43.70	43.56
12005	Refl Pwr (DBM)	27.0	26.50	26.10	F	F	25.62	26.30	25.85
12105		36.45	37.50	37.14	37.08	37.39	37.16	35.38	36.50
12227	Con Volt Loop Stress (MHz) (2)	1.54	2.14	1.12	F	F	1.71	1.68	1.60
12228		2.53	1.51	-0.01	-0.22	0.27	0.45	0.46	0.41
12229	Temp Mod (DGC)	19.5	18.51	20.88	17.97	17.49	16.25	16.42	17.71
12232	+15 VDC Pwr Suply (TMV)	2.65	2.65	2.65	2.65	2.65	2.65	2.55	2.60
12234	-15 VDC Pwr Suply (TMV)	4.07	4.27	3.94	4.04	4.10	4.04	4.00	4.04
12236	+5 VDC Pwr Suply (TMV)	3.55	3.57	3.54	3.51	3.47	3.49	3.45	3.50
12238	-5 VDC Pwr Suply (TMV)	4.08	4.20	4.01	4.07	4.08	4.12	4.13	4.02
12240	-24 VDC Unreg Pwr (TMV)	5.86	6.20	5.66	5.90	5.93	5.93	5.97	5.91
12242	Temp. Inv (DGC)	23.7	24.12	23.79	22.53	22.29	22.15	20.98	20.90

NOTES:

(1) Function numbers for WPA-1 = 120XX; for WPA-2 = 121XX
(2) Any reading other than -14.0 or +14.0 is acceptable

F - Unit OFF in this period.

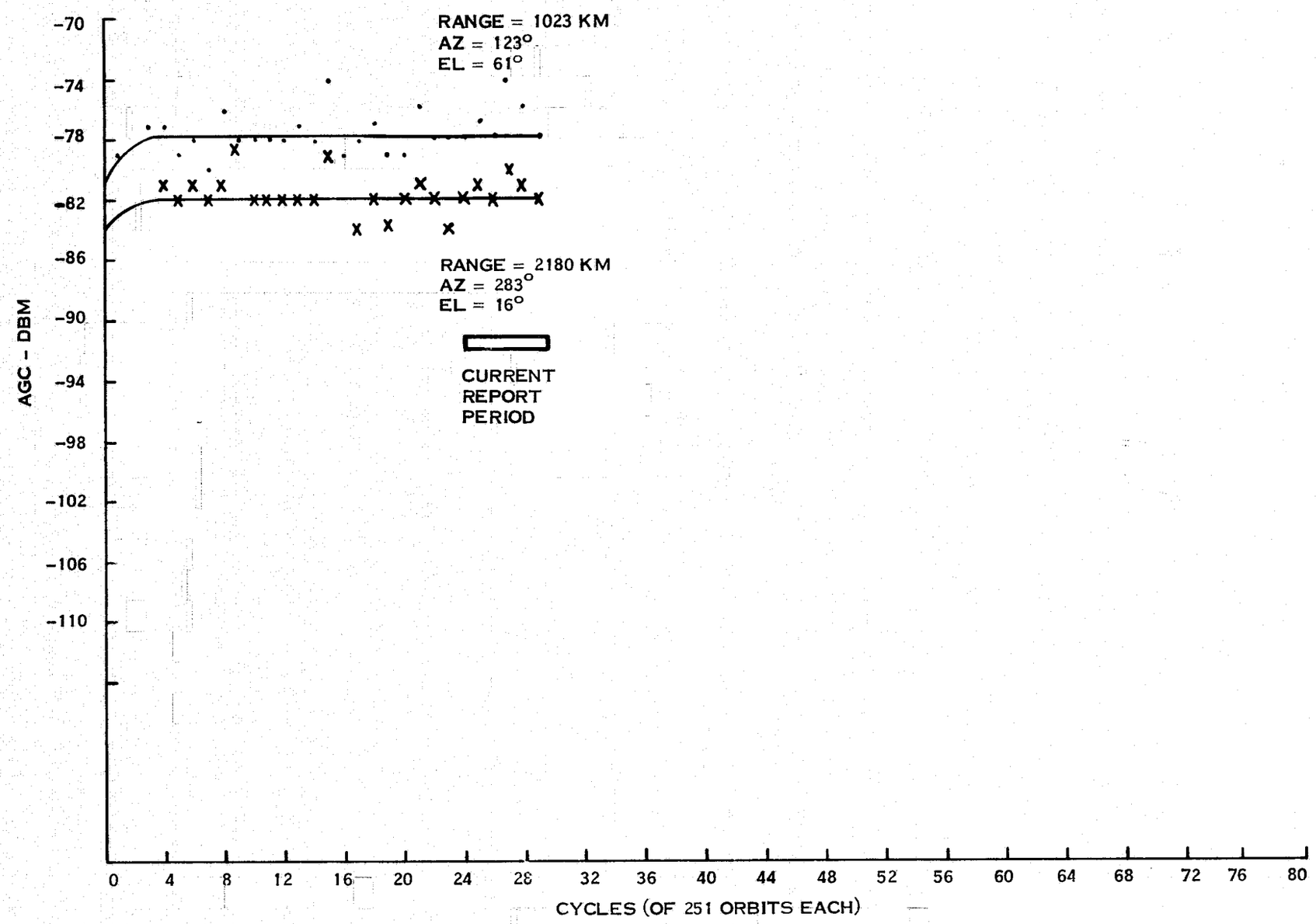


Figure 13-1. WPA-2 (Link 3) AGC Readings at Goldstone with 30' Antenna, Landsat-2

SECTION 14

ATTITUDE MEASUREMENT SENSOR (AMS)

The AMS is a passive radiometric balance sensor which operates in the 14-16 micron IR band. AMS Telemetry Values are shown in Table 14-1.

The AMS was launched in the OFF mode, turned ON during Orbit 6, and has been performing normally since then.

Table 14-1. Landsat-2 AMS Temperature Telemetry

Function	Description	Units	Orbit Number						
			50	2532	5102	6362	6761	7210	7641
3004	Case Temp 1	DGC	19.00	19.02	18.68	18.34	18.06	17.90	17.87
3005	Assembly - Temp-2	DGC	18.70	18.71	18.30	17.88	17.66	17.45	17.45

SECTION 15

WIDEBAND VIDEO TAPE RECORDERS (WBVTR)

WBVTR-1 has had limited operational use through this reporting period because of previously reported problems with one of its Record/Playback heads (Orbit 2683, 3 August 1975). Ground stations were unable to obtain MSS video sync lockup because of failure of one of the 4 heads. As a result it cannot be used with MSS data but the NASA Data Processing Facility (NDPF) has developed a modification of their ground processing system so that it will perform satisfactorily with RBV data. RBV provides a synchronizing pulse which permits data from the bad head to be isolated and eliminated. This loss of 25% of the data is obscured by substituting an adjacent prior line of data maintaining usefullness of the scene for most purposes. A sequence of RBV scenes was recorded on WBVTR-1 during the fourth quarterly engineering test of the RBV (May 13, 1976). Sample scenes are shown in Section 16, Return Beam Vidicon. Since Orbit 7181 on 20 June 1976 the recorder has been used regularly in this service recording RBV data.

WBVTR-2 has functioned normally throughout this period.

Table 15-1 gives typical telemetry values for WBVTR-1 and WBVTR-2. Tables 15-2 and 15-3 show the telemetry values for Record, Playback, Rewind, and Standby operational modes.

Figure 15-1 shows tape usage for WBVTR-2.

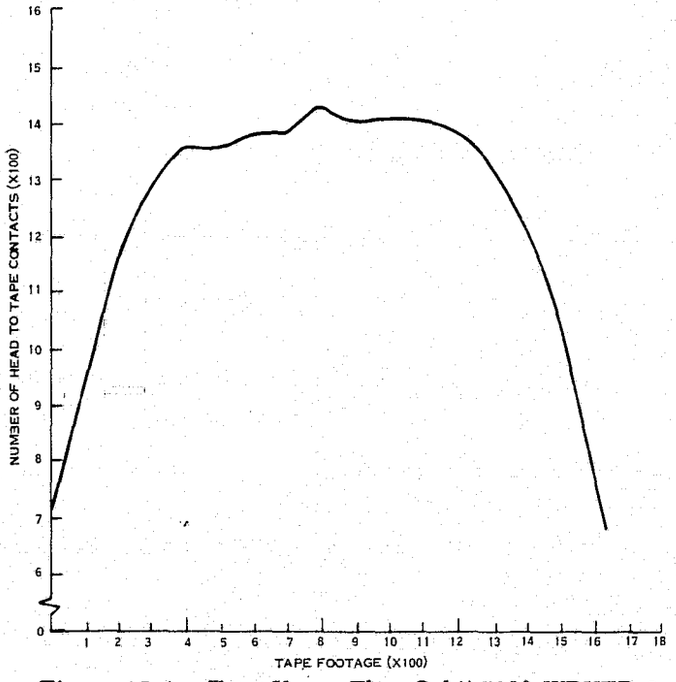


Figure 15-1. Tape Usage Thru Orbit 7630 WBVTR-2

Table 15-1. WBVTR Telemetry Values

WBVTR-1 Functions		Telemetry Values In Orbits						
Number	Name	45/46	2642	4879 (ET)	6322	6642 ET	7431	7628
13022	Pressure Trans	16.52	16.51	16.39	16.25	16.38	16.12	16.14
13023	Temp Trans	20.74	20.62	20.12	18.70	19.00	16.96	18.70
13024	Temp Elec	25.00	24.57	21.68	19.58	19.61	20.01	19.05
13032	Limiter Volt	1.48	1.51	1.41	*	1.48	1.53	1.48
13034	+5.6 VDC Conv	5.70	5.54	5.67	*	5.54	5.77	5.67
13201	+2 VDC APU	2.44	2.45	2.45	2.45	2.45	2.45	2.45
13202	Temp APU	29.06	26.76	27.29	26.44	27.68	27.50	26.44

WVVTR-2 Functions		Telemetry Values In Orbits						
Number	Name	45/46	2642	5071	6322	6770	7230	7621
13122	Pressure Trans	16.12	15.81	15.33	15.06	14.88	14.80	14.67
13123	Temp Trans	21.50	20.00	23.08	20.81	19.89	20.37	19.41
13124	Temp Elec	23.50	18.31	22.72	19.89	22.29	23.92	22.07
13132	Limiter Volt	1.30	1.32	1.28	1.31	1.34	1.33	1.35
13134	+5.6 VDC Conv	5.71	5.69	5.85	5.71	5.54	5.59	5.87
13201	-12 VDC APU	2.44	2.45	2.45	2.45	2.45	2.45	2.45
13202	Temp APU	29.06	26.76	27.63	26.44	26.36	26.18	26.36

(ET) - Engineering Test of WBVTR-1

* - No data. WBVTR-1 out of service

Table 15-2. Function Values by Mode, Landsat-2 WBVTR-1 Telemetry

WBVTR-1 Function/Description	Orbit							
	T/V	ORB 31/46	2642	4878(ET)	5688 (ET)	6644/6649	7208/7224	7628/7643
13029 - Input P/B Voltage								
Record	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Playback	0.33	0.60	0.32	0.30	0.40	0.40	0.36	0.32
Rewind	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Standby	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13028 - Capstan Motor Current								
Record	0.32	0.31	0.33	0.31	0.36	0.26	0.31	0.33
Playback	0.29	0.26	0.31	0.30	0.33	0.34	0.30	0.35
Rewind	0.23	0.19	0.23	0.28	0.31	0.29	0.23	0.31
Standby	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13030 - Headwheel Motor Current								
Record	0.50	0.50	0.50	0.53	0.48	0.51	0.51	0.50
Playback	0.495	0.49	0.49	0.53	0.52	0.52	0.52	0.53
Rewind	0.41	0.44	0.44	0.47	0.47	0.46	0.47	0.47
Standby	0.41	0.45	0.45	0.46	0.47	0.46	0.44	0.44
13031 - Recorder Input Current								
Record	3.58	3.69	3.69	3.62	3.58	3.65	3.67	3.62
Playback	3.95	3.37	3.86	3.86	3.34	3.37	3.93	3.34
Rewind	2.18	2.23	2.19	2.23	2.30	2.26	2.30	2.28
Standby	1.79	1.78	1.95	1.95	1.95	1.92	1.81	1.81
13033 - Servo Voltage								
Record	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Playback	49.99	50.01	50.08	50.37	50.18	50.37	50.18	50.04
Rewind	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Standby	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13026 - Capstan Motor Speed								
Record	89.77	88.61	88.03	85.13	85.13	85.13	85.55	85.03
Playback	89.37	88.35	86.87	85.13	86.29	86.87	86.87	87.45
Rewind	100.12	100.2	98.48	96.73	96.73	96.73	96.73	98.48
Standby	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13027 - Headwheel Motor Speed								
Record	97.5	96.72	95.07	93.96	93.96	92.86	93.45	94.07
Playback	96.86	97.28	94.52	92.86	94.52	94.52	94.52	92.86
Rewind	98.96	98.6	96.73	96.73	94.52	94.52	96.73	96.73
Standby	99.12	98.39	95.62	95.07	93.96	95.07	92.86	93.96

(ET) - Engineering Test of WBVTR-1

Table 15-3. Function Values by Mode, Landsat-2 WBVTR-2 Telemetry

WBVTR-2 Function/Description	Orbit							
	T/V	31/46	2642	4878	5654	6644/6649	7207/7360	7626/
13129 - Input P/B Voltage								
Record	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Playback	0.37	0.35	0.33	0.34	0.34	0.35	0.32	0.34
Rewind	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Standby	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13128 - Capstan Motor Current								
Record	0.33	0.33	0.37	0.38	0.34	0.33	0.32	0.34
Playback	0.34	0.33	0.34	0.35	0.35	0.35	0.33	0.34
Rewind	0.16	0.20	0.18	0.15	0.19	0.20	0.20	0.19
Standby	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13130 - Headwheel Motor Current								
Record	0.47	0.47	0.47	0.48	0.47	0.49	0.50	0.50
Playback	0.46	0.48	0.47	0.48	0.49	0.48	0.50	0.48
Rewind	0.43	0.44	0.42	0.41	0.44	0.42	0.47	0.49
Standby	0.45	0.43	0.43	0.41	0.41	0.41	0.49	0.42
13131 - Recorder Input Current								
Record	2.88	2.90	2.90	2.90	2.90	2.96	2.98	2.96
Playback	3.11	3.14	3.08	3.11	3.17	3.17	3.11	3.08
Rewind	1.79	1.80	1.80	1.80	1.84	1.80	1.84	1.83
Standby	1.18	1.51	1.48	1.62	1.48	1.62	1.57	1.53
13133 - Servo Voltage								
Record	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Playback	48.92	49.00	49.52	49.43	49.23	49.43	49.23	49.52
Rewind	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Standby	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13126 - Capstan Motor Speed								
Record	108.66	112.10	105.33	105.33	105.33	105.33	104.64	105.33
Playback	108.38	112.10	105.33	103.96	104.64	103.69	103.02	105.33
Rewind	130.09	120.43	116.31	117.68	118.37	116.31	117.68	117.68
Standby	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13127 - Headwheel Motor Speed								
Record	98.41	98.08	96.52	95.48	95.48	94.96	94.44	94.44
Playback	98.11	97.04	94.44	94.44	94.96	94.44	94.96	94.44
Rewind	99.95	98.6	95.48	96.52	97.04	95.48	96.52	97.04
Standby	101.72	100.79	94.96	96.00	94.44	96.00	99.44	94.44

SECTION 16

RETURN BEAM VIDICON

The fourth periodic test of the RBV Subsystem was performed on May 12, 13, and 14, 1976. In Orbit 6634, the downlink filters were configured and all RBV modes were set up. Engineering tests were executed in Orbit 6635. The RBV Subsystem and WBVTR-1 were exercised in real time and playback through Orbit 6667.

In Orbit 7181 and throughout this report period, the RBV and WBVTR-1 were used for limited operations. All RBV operations during this report period were nominal, and telemetry data was normal.

Table 16-1 gives typical telemetry values for the RBV Subsystem. Tables 16-2, 16-3 and 16-4 give telemetry values for Prepare, Hold, and Read modes of the three RBV cameras.

Figures 16-1, 16-3 and 16-5 are samples of Real Time RBV imagery taken by all three cameras during the test. Figures 16-2, 16-4 and 16-6 are images of the same scene played back from WBVTR-1.

NOTE: One head circuit of WBVTR-1 does not operate, as previously reported (Aug. 3, 1975). The NASA Data Processing Facility has implemented a hardware change which fills the missing line with repeat data of the prior line.

Table 16-1. RBV Telemetry Values

Function			Orbits					
No.	Name	T/V Value	54	2371	5662	6650	7214	7671
14001	CCC Board Temp. (DgC)	N/A	19.65	20.27	20.41	20.09	19.52	19.17
14002	CCC Pwr. Sup. Temp (DgC)	N/A	20.52	21.46	20.80	21.33	20.06	19.84
14003	15 VDC Sup. (TMV)	N/A	3.92	3.92	4.00	3.92	3.37	3.44
14004	+6V, -5.25 VDC Sup. (TMV)	N/A	2.92	3.07	3.13	3.05	2.64	2.69
14100		0.98	NA	0.70	0.70	0.70	0.80	1.26
14200 *	VID Output V (TMV)	0.93	1.05	1.23	1.26	1.22	0.70	1.15
14300		1.06	1.03	1.27	1.31	1.18	0.69	1.05
14102		3.75-4.02	3.85	3.81	3.82	3.82	3.82	3.82
14202 *	Comb. Align Cur. (TMV)	3.87-4.10	3.91	3.92	3.98	3.92	3.89	3.92
14302		3.80-4.05	3.90	3.80	3.83	3.79	3.32	3.40
14103		N/A	24.24	24.40	26.51	25.05	22.67	22.41
14203 *	Elec Temp. (DgC)	N/A	19.84	22.40	22.05	22.37	20.38	20.01
14303		N/A	25.05	24.15	29.42	25.56	22.63	22.46
14104		N/A	23.44	24.13	26.28	24.69	22.01	21.83
14204 *	LV Pwr Sup T. (DgC)	N/A	18.14	20.87	20.61	20.86	18.59	18.32
14304		N/A	25.36	24.12	29.17	25.36	22.45	22.22
14105		3.92-4.07	4.00	3.94	3.96	3.93	3.44	3.50
14205 *	Defl. Pwr. Sup. +10 VDC (TMV)	3.95-4.10	3.97	3.92	3.94	3.95	3.98	3.98
14305		3.95-4.07	4.00	3.95	3.96	4.00	4.00	4.00
14106		3.65-3.80	3.67	3.59	3.63	3.63	3.16	3.23
14206 *	L.V.P.S. +6V, -6.3 VDC (TMV)	3.67-3.80	3.65	3.61	3.62	3.60	3.14	3.19
14306		3.65-3.77	3.70	3.66	3.68	3.68	3.70	3.71
14107		2.53	2.61	2.54	2.61	2.63	2.54	2.53
14207 *	Ther. Elec. Cur. (TMV)	2.43	2.49	2.44	2.51	2.50	2.31	2.31
14307		2.52	2.57	2.52	2.57	2.32	2.94	2.85
14108		1.80-3.50	2.43	2.48	2.50	2.46	2.19	2.25
14208 *	Vid. Fil. Cur. (TMV)	2.55-2.75	2.40	2.31	2.36	2.36	2.09	2.12
14308		2.50-2.80	2.58	2.54	2.54	2.55	2.25	2.27
14110		2.95-3.20	2.98	2.95	2.96	2.99	2.99	2.98
14210 *	Vid. Tgt. Volt (TMV)	3.15-3.45	2.86	2.93	2.96	2.90	2.59	2.64
14310		2.55-2.80	2.63	2.56	2.58	2.59	2.26	2.31
14113		2.86	2.92	2.79	2.81	2.86	3.51	3.22
14213 *	Vert Def V (TMV)	3.09	3.15	2.99	3.05	3.10	3.63	3.79
14313		3.91	3.59	3.48	3.44	3.50	3.54	3.09
14114		21.99	19.87	20.67	19.21	18.91	16.71	16.32
14214 *	Vid FPT (DgC)	21.00	20.55	21.14	19.80	19.66	18.24	17.77
14314		22.66	20.65	21.12	20.56	20.18	18.42	18.05
14115		24.17	21.04	22.41	21.31	20.57	18.22	17.79
14215 *	Foc Coil T (DgC)	23.82	20.67	22.22	21.26	20.75	18.70	18.16
14315		24.47	22.25	23.08	22.89	22.04	19.61	19.17

* 141XX refers to Camera 1
142XX refers to Camera 2
143XX refers to Camera 3
NA - Data not Available

Table 16-2. Camera #1 (Blue) Telemetry (Values in TMV)

Function No.	Function Name	Mode	Orbit						
			T/V Value	054	2371	5663	6639ET	7211	7671
14101	Focus I	Hold	0.66	0.65	0.70	0.69	0.67	0.65	0.63
		Prep	1.71	1.68	1.75	1.74	1.72	1.67	1.67
		Read	2.83	2.80	2.90	2.85	2.84	2.80	2.80
14109	Grid V	Prep	0.79	0. 0	0.80	0.78	0.79	0.77	0.77
		Read	2.43	2.42	2.44	2.42	2.43	2.45	2.45
		Hold	4.00	3.95	4.00	3.98	3.98	3.97	3.95
14111	Cath I	Hold	0.38	0.38	0.40	0.37	0.37	0.37	0.37
		Read	0.84	0.83	0.85	0.83	0.84	0.85	*
		Prep	3.03	3.05	3.10	3.02	3.02	3.02	3.02
14112	Hor Def	Hold	0.01	0.00	0. 00	0.00	0.00	0.00	0.00
		Prep	1.79	1.75	1.80	1.77	1.78	1.80	1.80
		Read	3.23	3.25	3.30	3.25	3.21	*	*
14120	+500 V	Prep	0.92	0.85	0.90	0.90	0.91	0.90	0.91
		Read	4.05	4.05	4.10	4.05	4.05	4.05	4.03

*No data due to slow TLM sample rate (1/16) which does not always get a sample for short "on time."

Table 16-3. Camera #2 (Yellow) Telemetry (Values in TMV)

Function No.	Function Name	Mode	Orbit						
			T/V Value	054	2371	5663	6639ET	7211	7671
14201	Focus I	Hold	0.58	0.54	0.60	0.53	0.54	0.52	0.50
		Prep	1.60	1.56	1.60	1.54	1.56	1.52	1.50
		Read	2.71	2.65	2.70	2.65	2.67	2.65	2.62
14209	Grid V	Prep	0.83	0.75	0.85	0.80	0.80	0.80	0.77
		Read	2.25	2.25	2.30	2.22	2.21	2.25	2.25
		Hold	4.13	4.05	4.10	4.11	4.11	4.07	4.07
14211	Cath I	Hold	0.37	0.37	0.35	0.35	0.37	0.37	0.37
		Read	0.95	0.95	1.00	0.95	0.95	0.95	*
		Prep	3.05	3.05	3.10	3.05	3.05	3.05	3.05
14212	Hor Def	Hold	0.01	0.00	0.00	0.00	0.00	0.00	0.00
		Prep	1.87	1.85	1.90	1.87	1.87	1.87	1.87
		Read	3.32	3.25	3.30	3.31	3.24	*	*
14220	+500 V	Prep	1.14	1.15	1.20	1.14	1.14	1.15	1.14
		Read	4.29	4.25	4.30	4.27	4.27	4.30	4.27

* No data due to slow TLM sample rate (1/16) which does not always get a sample for short "on time".

Table 16-4. Camera #3 (Red) Telemetry (Values in TMV)

Function No.	Function Name	Orbit						
		Mode	054	2371	5663	6639ET	7211	7671
14301	Focus I	Hold	0.65	0.70	0.72	0.69	0.65	0.65
		Prep	1.79	1.83	1.85	1.82	1.77	1.77
		Read	2.85	2.90	2.93	2.90	2.85	2.85
14309	Grid V	Prep	0.75	0.80	0.75	0.76	0.77	0.77
		Read	2.65	2.70	2.66	2.66	2.70	2.71
		Hold	4.08	4.18	4.13	4.12	4.10	4.09
14311	Cath I	Hold	0.39	0.40	0.40	0.40	0.40	0.40
		Read	0.54	0.55	0.55	0.55	*	*
		Prep	3.25	3.30	3.22	3.23	3.25	3.23
14312	Hor Def	Hold	0.00	0.00	0.00	0.00	0.00	0.00
		Prep	2.05	2.10	2.07	2.06	2.07	2.06
		Read	3.35	3.45	3.42	3.41	*	*
14320	+500 V	Prep	1.15	1.20	1.15	1.15	1.15	1.15
		Read	4.25	4.30	4.27	4.27	4.27	4.27

* No Data due to slow TLM sample rate (1/16) which does not always get a sample for short "on time".

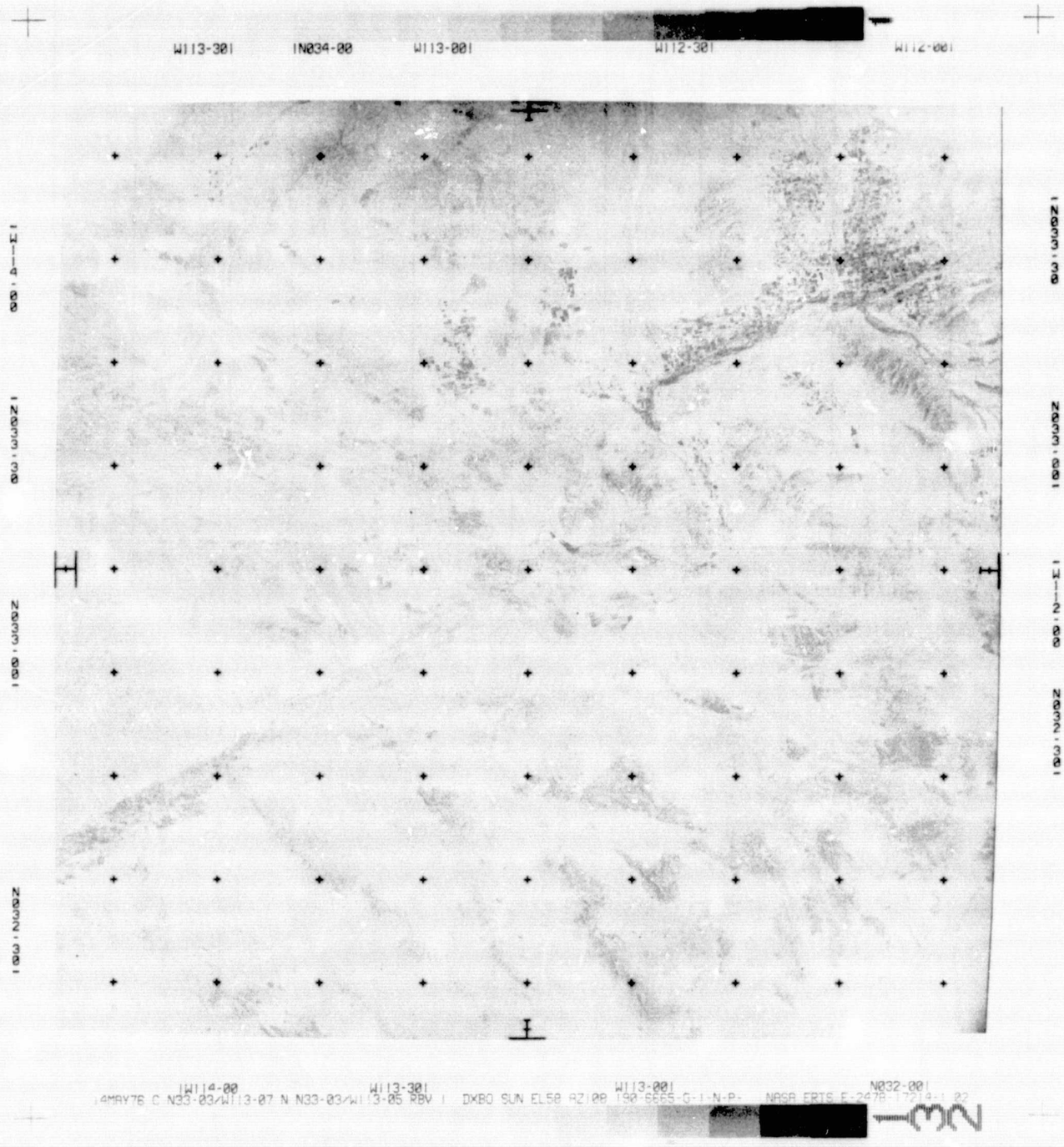


Figure 16-1. Landsat-2 Real Time Imagery - Camera 1

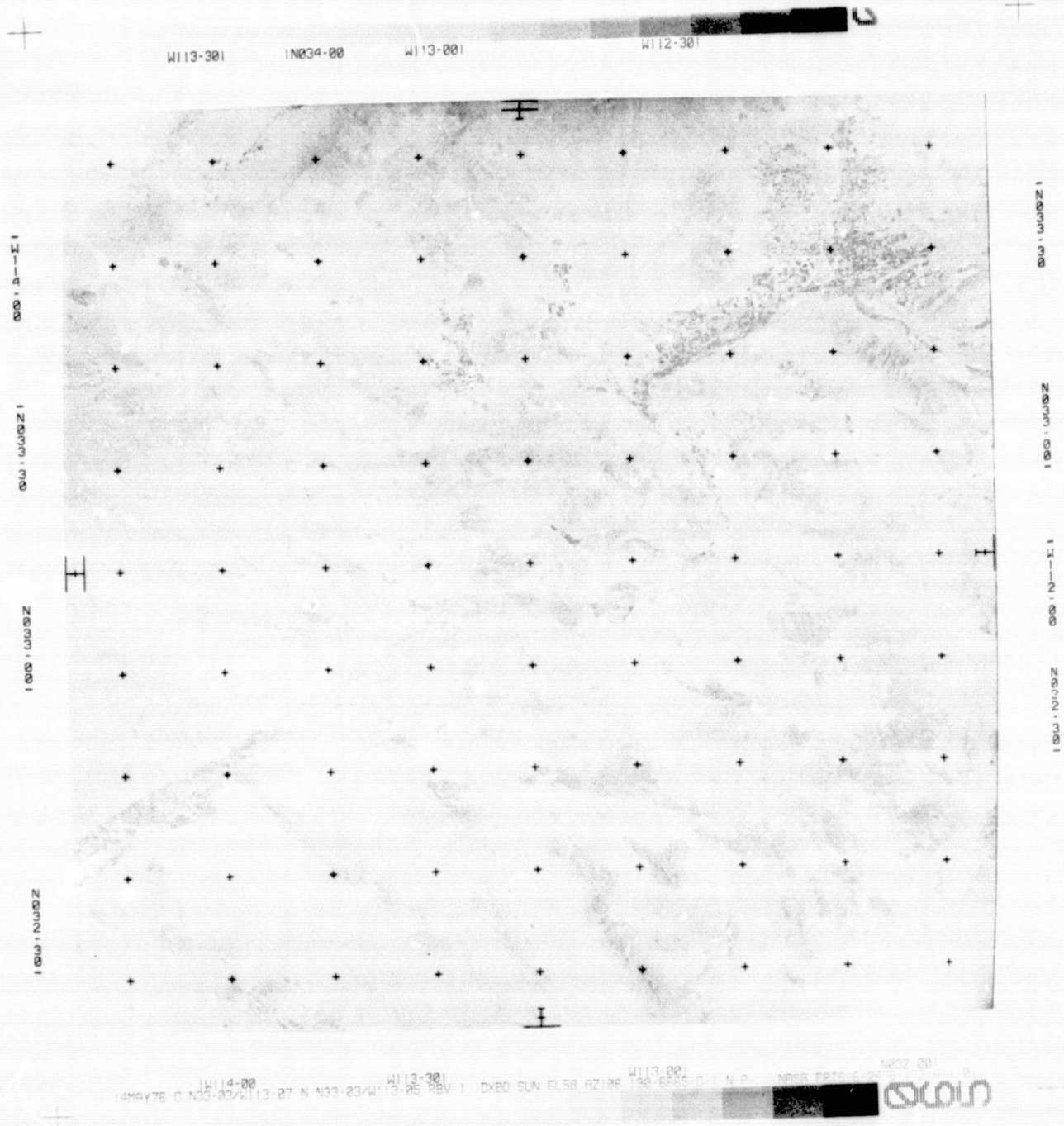


Figure 16-2. Landsat-2 Playback (WBVTR-1) Imagery - Camera 1

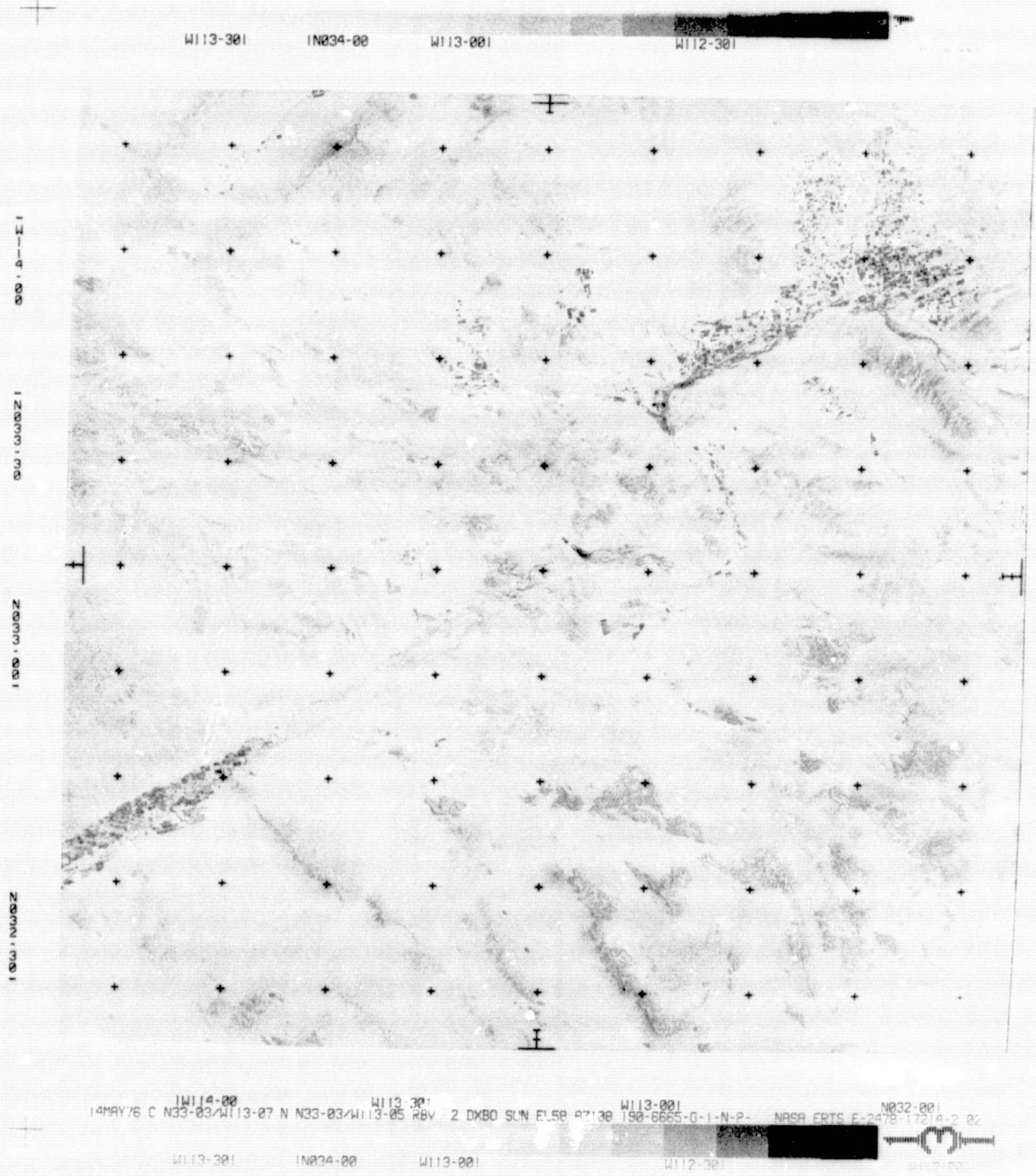


Figure 16-3. Landsat-2 Real Time Imagery - Camera 2

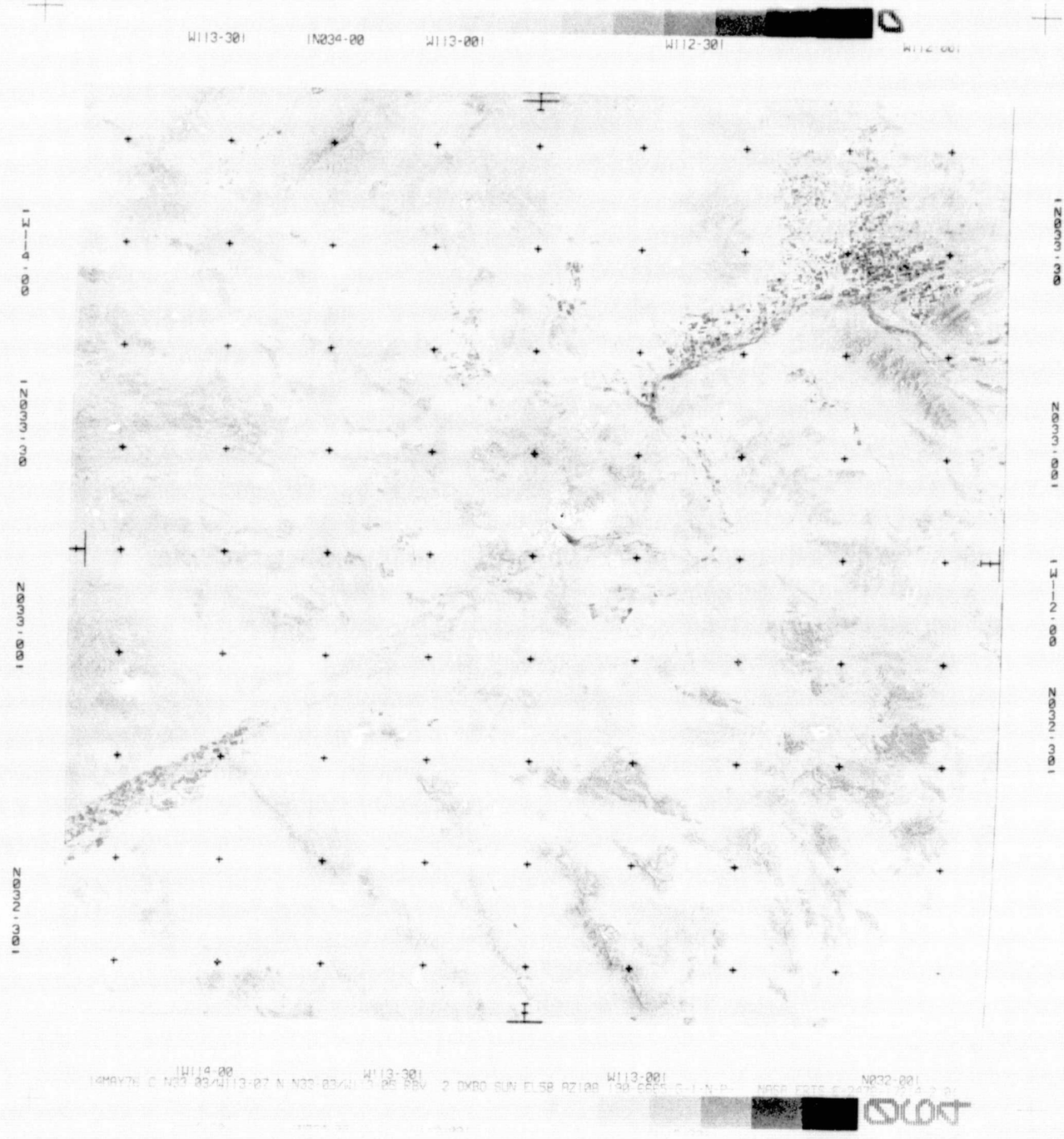


Figure 16-4. Landsat-2 Playback (WBVTR-1) Imagery - Camera 2

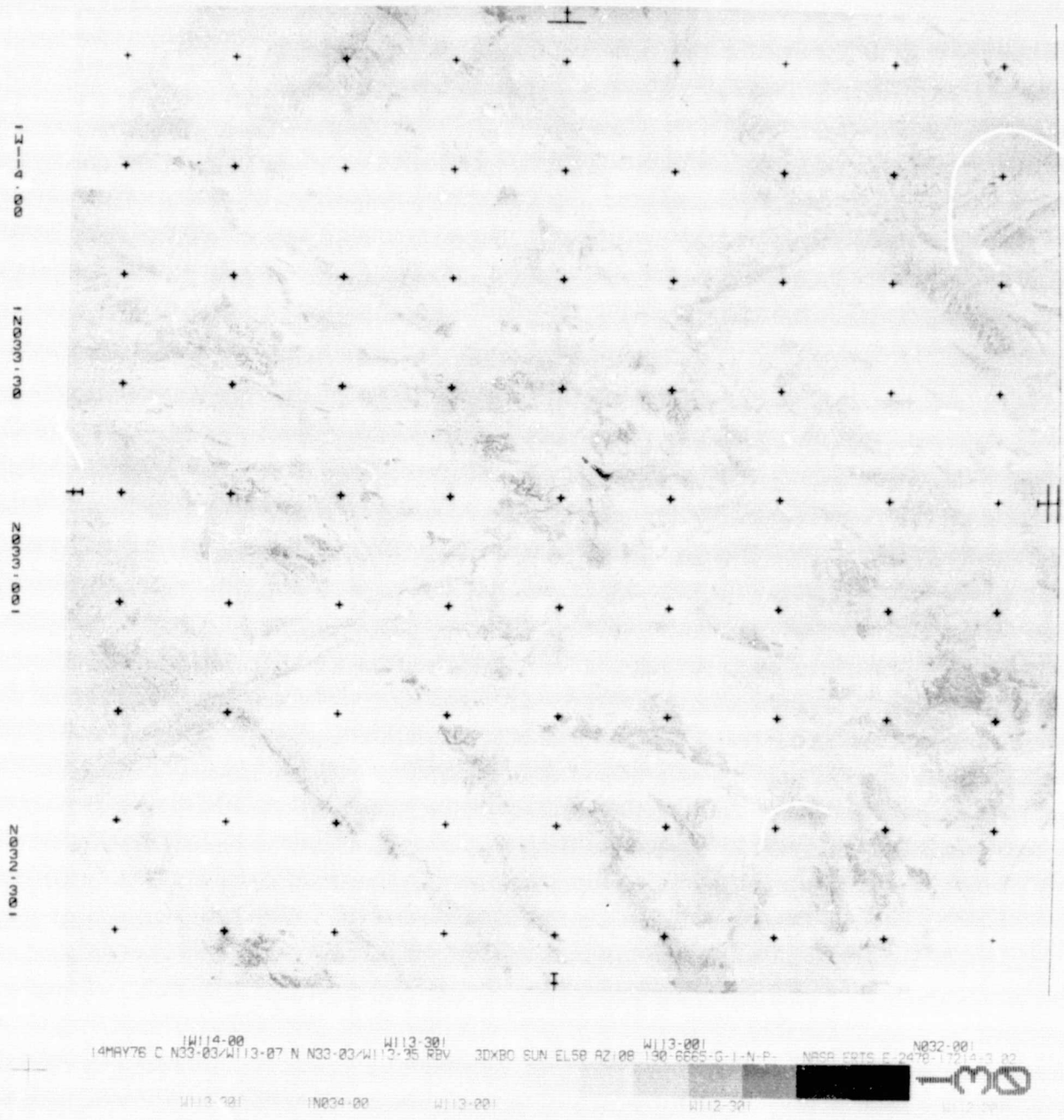


Figure 16-5. Landsat-2 Real Time Imagery - Camera 3

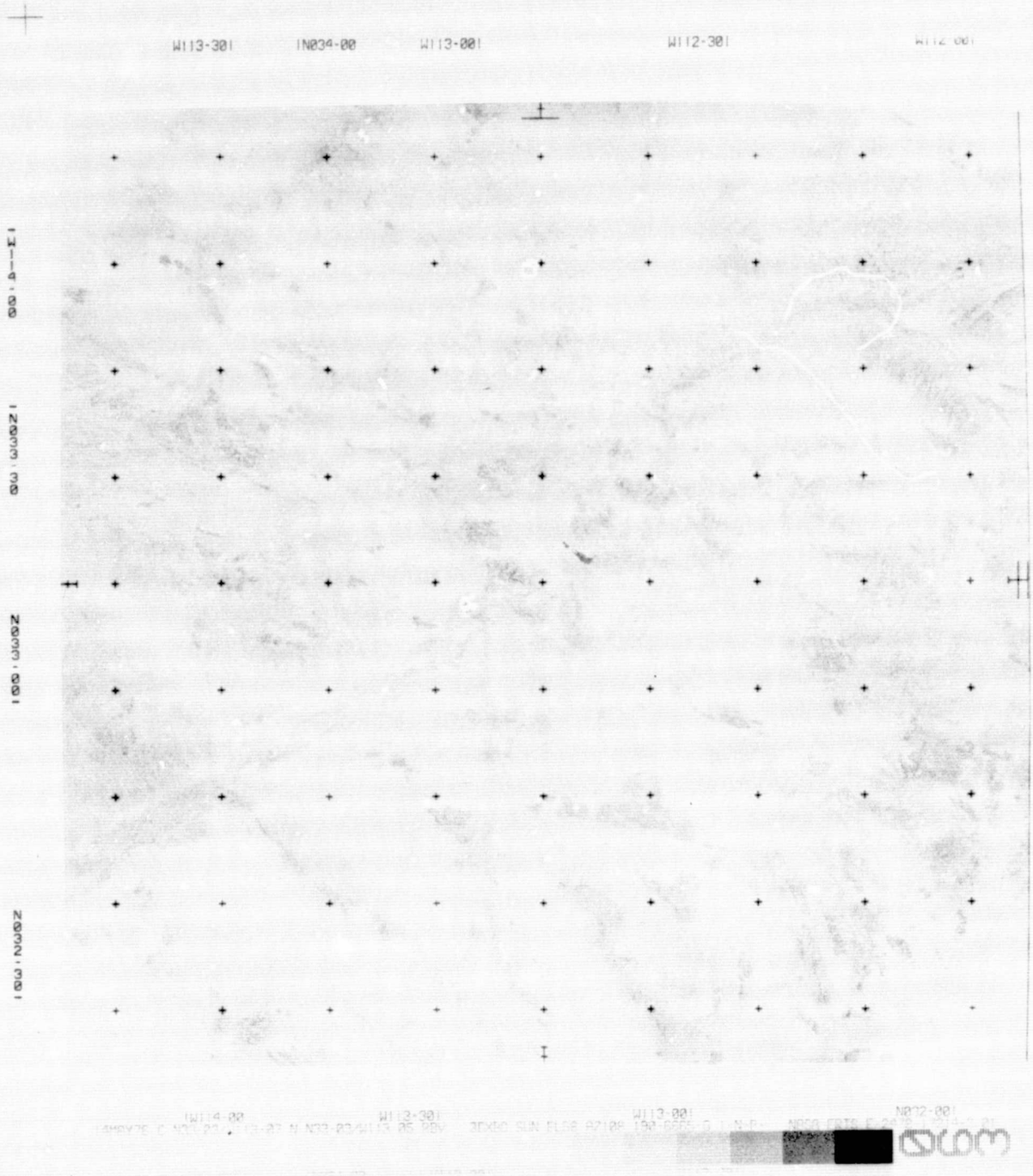


Figure 16-6. Landsat-2 Playback (WBVTR-1) Imagery - Camera 3

SECTION 17

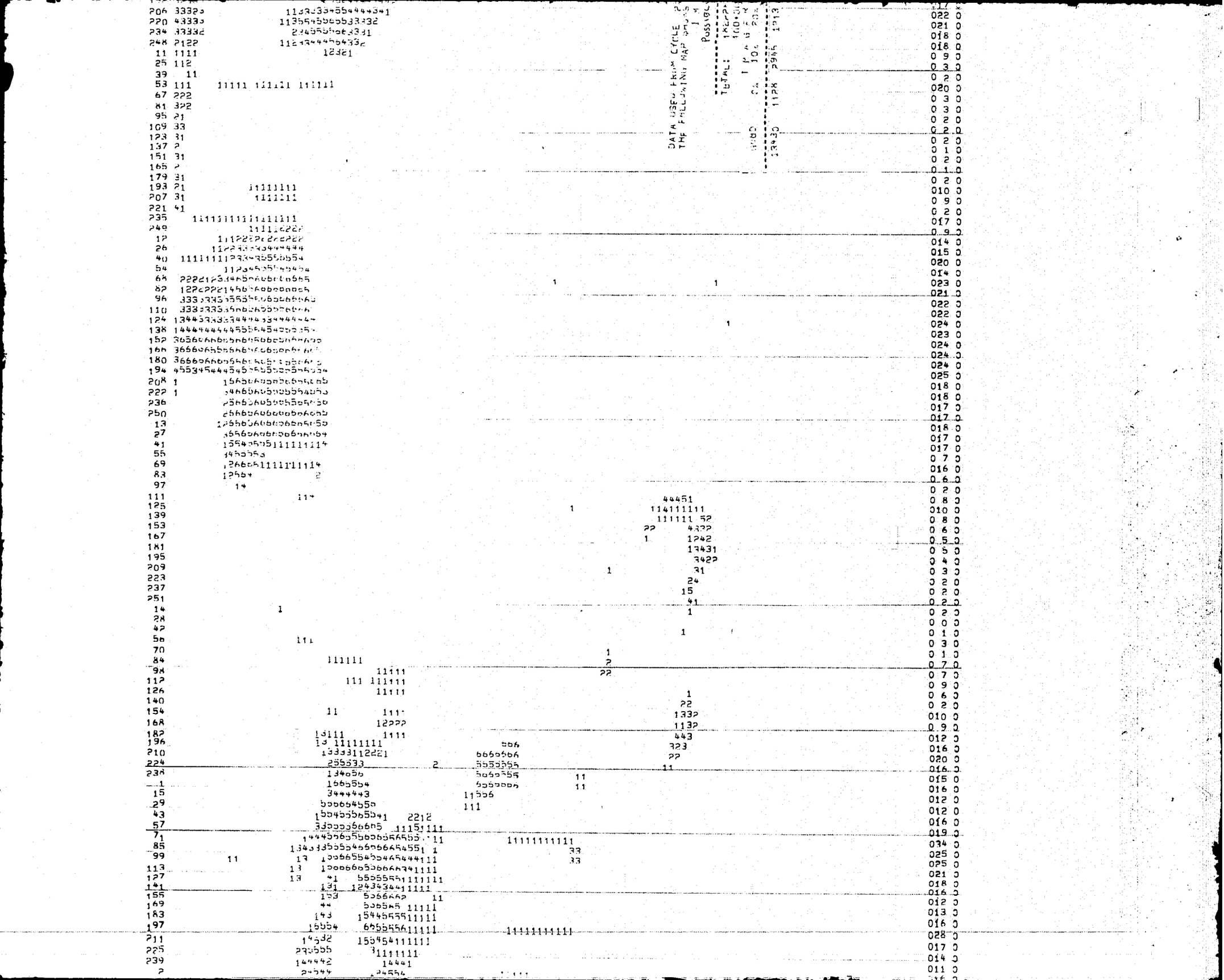
MULTISPECTRAL SCANNER SUBSYSTEM (MSS)

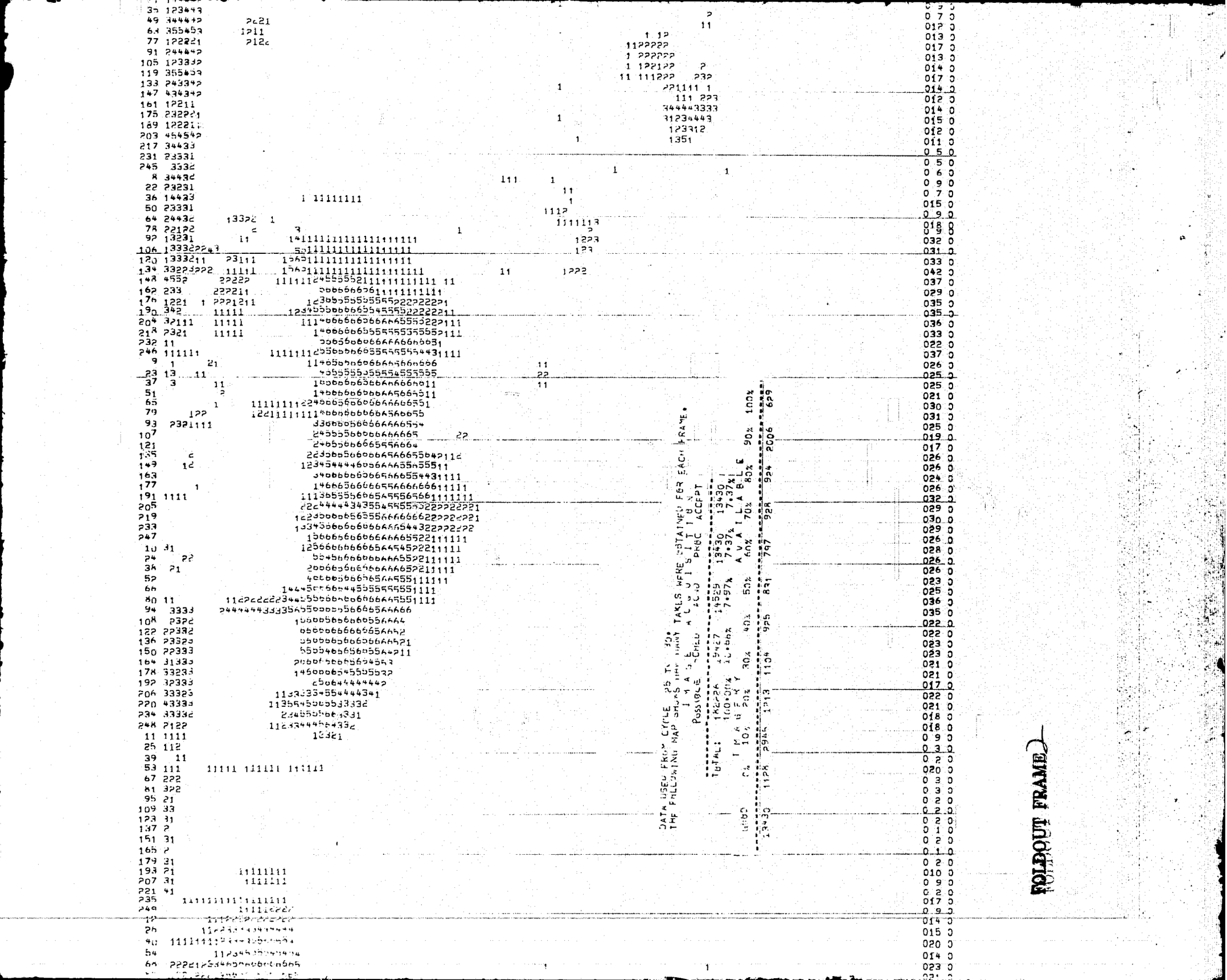
The MSS Subsystem has operated nominally in this period without incident. Figure 17-1 shows the number of scenes imaged at each geographic location this quarter, and Figure 17-2 shows images since launch.

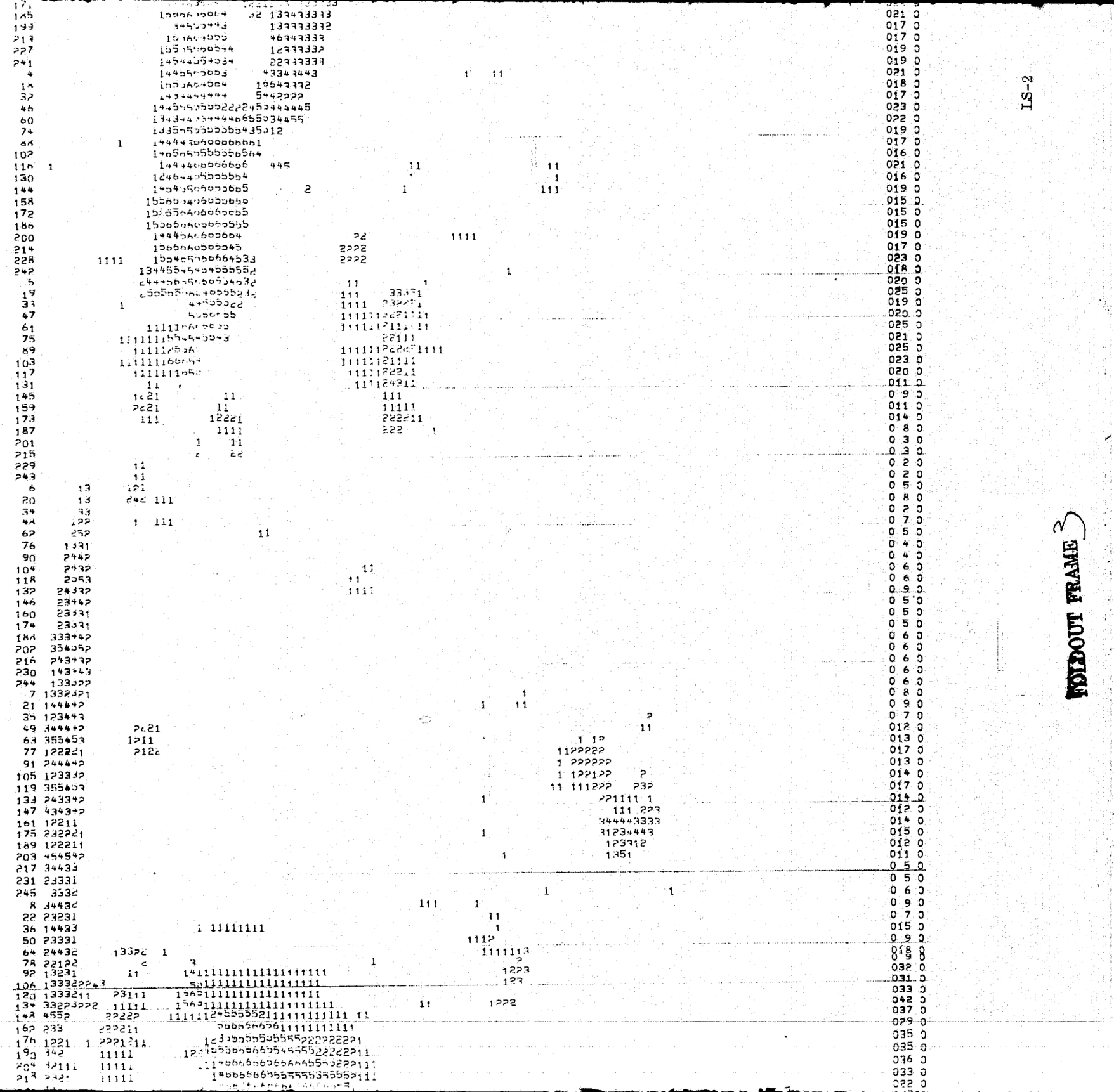
In these maps, only those scenes received by U.S. ground stations are shown. Scenes transmitted to Canada, Brazil and Italy (36% of total) are not shown.

Table 17-1 shows typical telemetry values since launch. All are nominal. Table 17-2 shows the history of sensor response to a constant input radiance level. Each sensor is sampled at 5 radiance levels and all show essentially the same trends. Only one of these levels (the second highest) is listed in Table 17-2. Line length history is also shown in Table 17-2 and is nominal.

Sun calibrations, performed every two weeks, show nominal performance.




DATA USED FROM CYCLE 25 TO 30.
THE FOLLOWING MAP SHOWS HOW MANY TAKES WERE OBTAINED FOR EACH FRAME.
TOTALS: 18228 13430 13430
AVAILABLE
FOLDOUT FRAME



IS-2

FOLDOUT FRAME

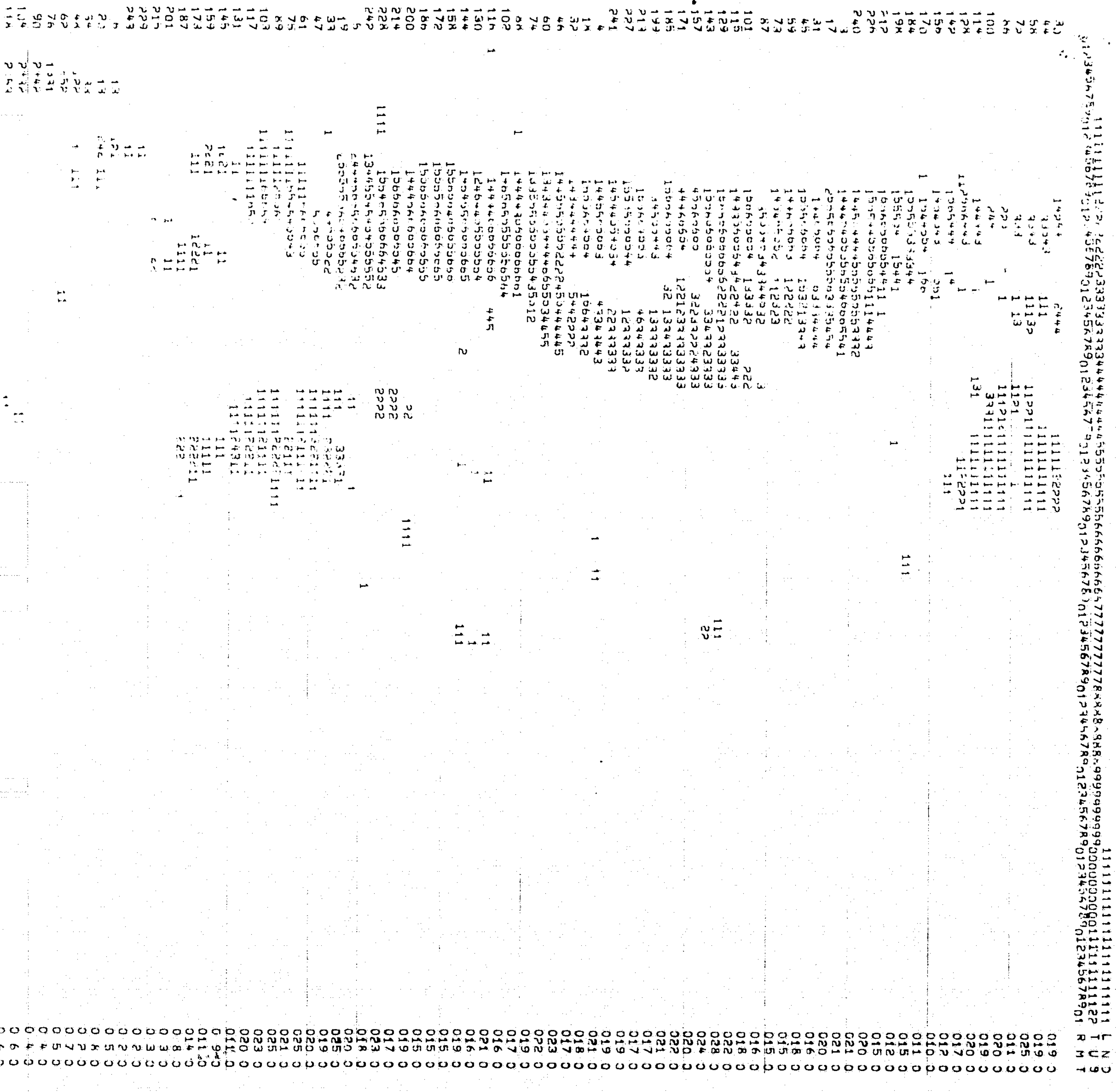
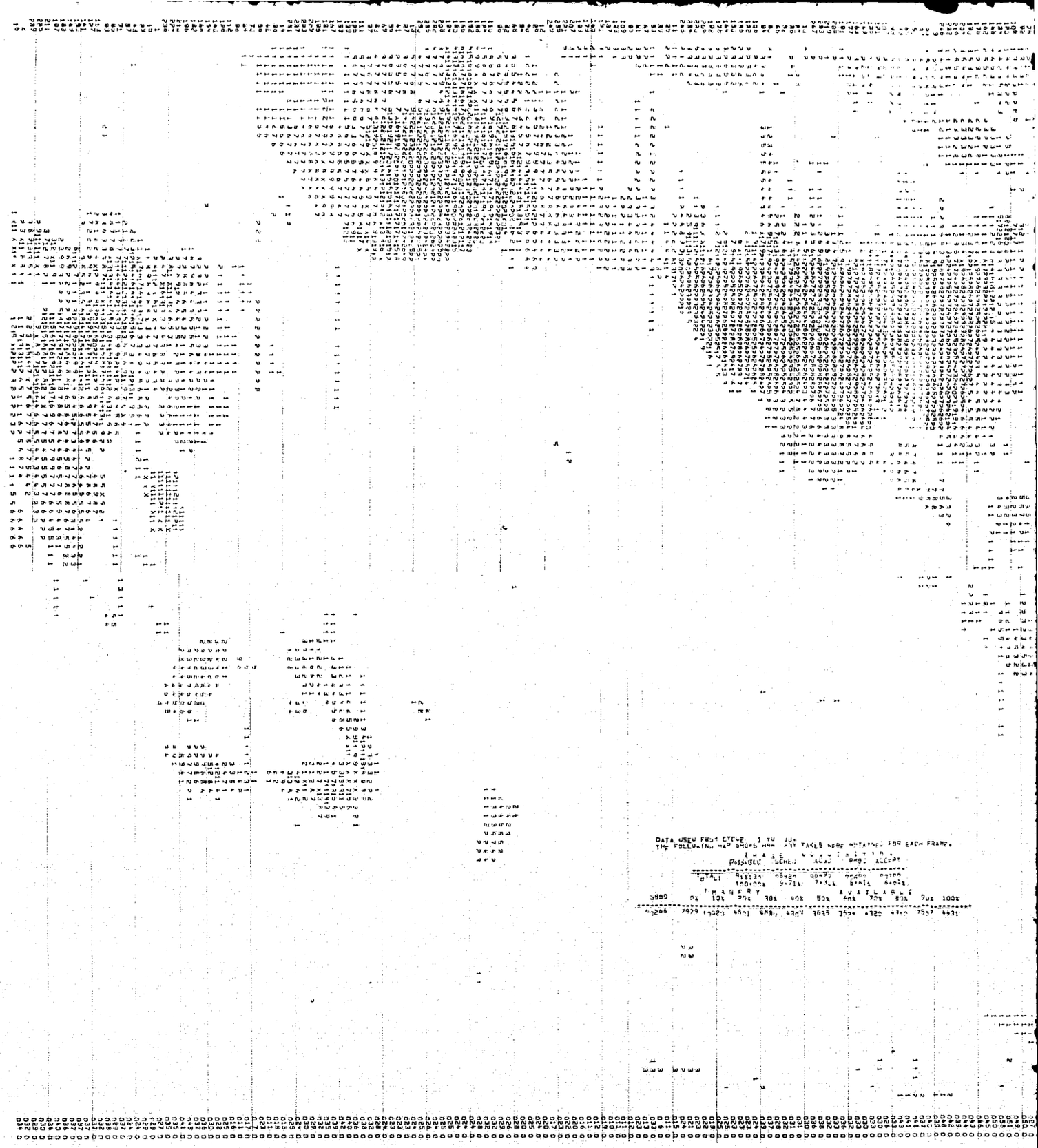


Figure 17-1. MSS Scenes Imaged this Quarter



FOLDOUT FRAME

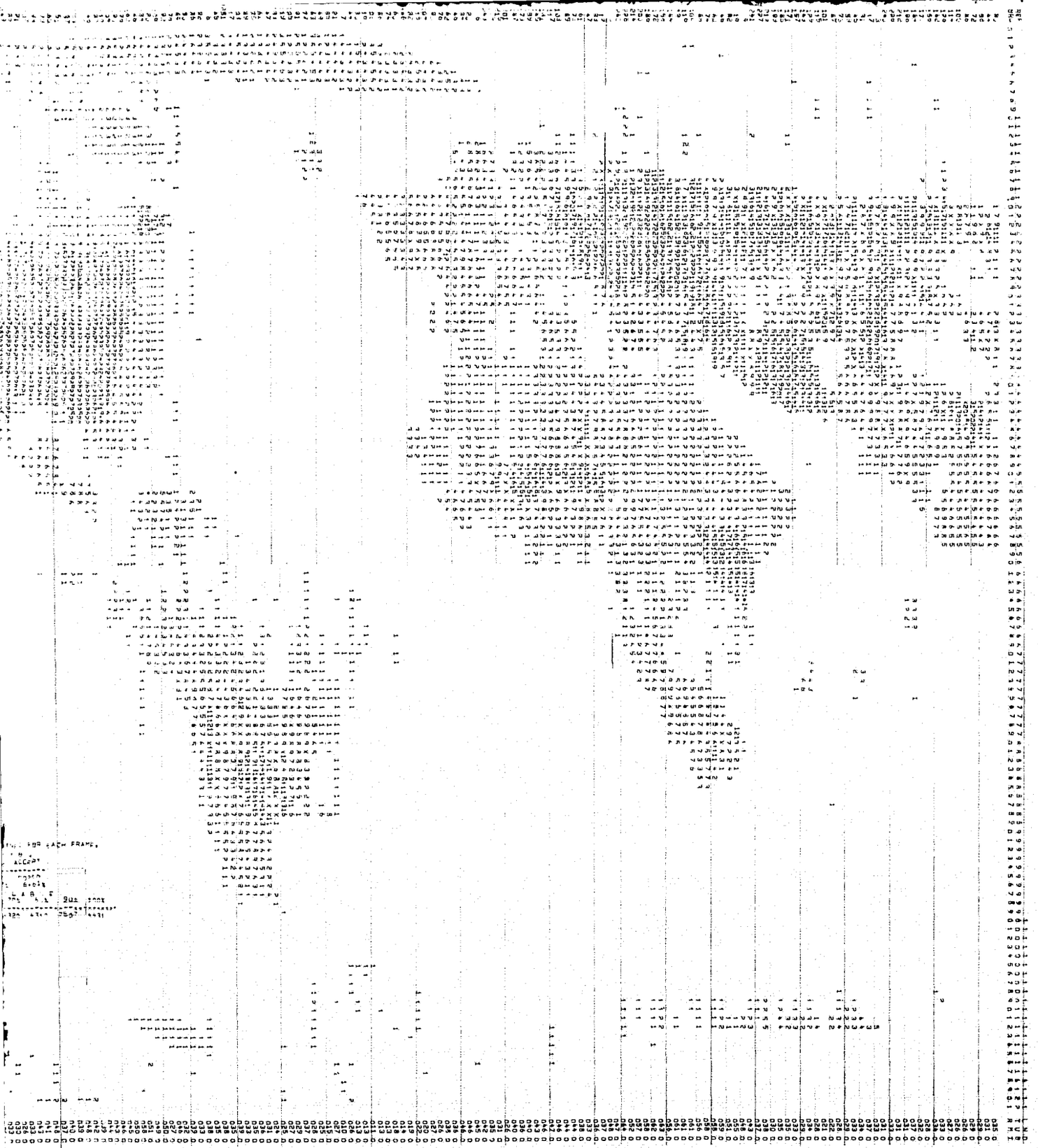


Figure 17-2. MSS Scenes Imaged Since Launch

FOLDOUT FRAME 2

Table 17-1. MSS Telemetry - Landsat-2

Function	Name	*T.V. Norm	Orbit						
			27	2500	5091	6362	6761	7210	7641
15040	MUX -6 VDC (TMV)	3.92	4.05	4.04	4.07	4.04	4.05	4.05	4.05
15041	A/D SUPPLY (TMV)	5.74	5.95	5.95	5.95	5.95	5.95	5.95	5.93
42	AVERAGE DENSITY (TMV)	1.72	1.71	2.39	1.95	2.39	2.39	2.32	2.16
43	FIBER OPTICS PLATE 1 TEMP (DGC)	22.30	18.13	20.41	21.75	20.59	17.57	17.47	17.21
44	FIBER OPTICS PLATE 2 TEMP (DGC)	22.30	17.87	18.86	20.28	19.04	15.70	15.59	15.29
45	MUX TEMP (DGC)	25.59	23.38	20.57	23.63	21.48	20.56	20.87	19.57
46	ELEC COVER TEMP (DGC)	23.09	20.25	21.40	22.96	21.72	17.20	17.21	16.63
47	PWR. SUP. TEMP. (DGC)	23.85	19.45	19.83	21.62	20.19	17.40	17.49	16.51
48	SCAN MIR REG. TEMP (DG)	23.44	18.30	18.29	21.13	19.07	16.76	16.87	15.93
49	SCAN MIR DRIVE ELEC. TEMP. (DGC)	24.34	18.96	18.49	21.42	19.32	17.06	17.22	16.01
15050	SCAN MIR DRIVE COVER TEMP. (DGC)	22.50	17.26	18.28	21.21	19.21	16.80	16.84	16.02
51	SCAN MIR TEMP (DGC)	21.87	17.26	18.09	20.89	18.76	16.52	16.51	15.87
52	ROT. SHUT HOUSING TEMP (DGC)	22.58	23.26	18.91	20.28	19.03	15.66	15.60	15.29
53	SCAN MIR REG VOLT (TMV)	4.56	4.7	4.57	4.57	4.63	4.60	4.59	4.39
54	CAL LAMP CURRENT (TMV)	1.18	1.17	1.20	1.17	1.17	1.17	1.17	1.17
55	BAND 1 15 VDC (TMV)	4.97	4.98	4.97	4.97	4.97	4.97	4.97	4.97
56	BAND 2 15 VDC (TMV)	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
57	BAND 3 15 VDC (TMV)	4.88	4.95	4.95	4.95	4.95	4.95	4.95	4.95
58	BAND 4 15 VDC (TMV)	4.83	5.00	5.00	5.00	5.00	5.00	5.00	5.00
59	TLM 15 VDC (TMV)	5.04	5.06	5.07	5.07	5.07	5.07	5.07	5.07
15060	+12 VDC +6 VDC (TMV)	4.92	5.03	5.02	5.02	5.02	5.02	5.02	5.01
61	LOGIC +5 VDC (TMV)	4.86	4.81	4.80	4.83	4.80	4.84	4.83	4.83
62	RECT. +19 VDC (TMV)	4.97	5.03	5.05	5.05	5.05	5.05	5.05	5.05
63	RECT. -19 VDC (TMV)	3.54	3.60	3.60	3.60	3.52	3.60	3.60	3.60
64	BAND 1 HVA (TMV)	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95
65	BAND 1 HVB (TMV)	5.03	F	F	F	F	F	F	F
66	BAND 2 HVA (TMV)	4.72	4.70	4.72	4.75	4.72	4.72	4.72	4.71
67	BAND 2 HVB (TMV)	4.70	F	F	F	F	F	F	F
68	BAND 3 HV A (TMV)	4.75	4.72	4.76	4.73	4.75	4.75	4.75	4.75
69	BAND 3 HVB (TMV)	4.65	F	F	F	F	F	F	F
15070	SHUT MOT. CONTR. INTEG (TMV)	2.49	2.60	2.60	2.60	2.60	2.57	2.58	2.60
15071	SCAN MIRROR DRIVE CLOCK (TMV)	1.93	2.0	2.00	2.00	2.01	2.00	2.00	1.99

* Thermal Vacuum Test Data at 20°C

F = Unit OFF

Table 17-2. MSS Response History - Landsat-2

Quantum Level for Selected Word
(0 = Black; 63 = White)

Band	Sensor	Launch	Average Value Since Launch	This Quarter	% Change Since Launch
1	1	43	40	39	-9
	2	41	40	39	-5
	3	46	43	42	-9
	4	46	45	44	-4
	5	44	40	39	-11
	6	46	43	42	-9
2	7	47	45	45	-4
	8	44	40	40	-9
	9	48	46	46	-4
	10	50	48	47	-6
	11	48	47	47	-2
	12	47	44	43	-9
3	13	42	40	39	-7
	14	44	43	42	-5
	15	47	46	46	-2
	16	47	45	46	-2
	17	48	46	46	-4
	18	46	44	44	-4
4	19	25	25	25	0
	20	26	27	26	0
	21	32	32	31	-3
	22	29	30	29	0
	23	32	33	32	0
	24	28	28	28	0
	Line Length	3250	3249	3247	-0.09

SECTION 18

DATA COLLECTION SYSTEM (DCS)

The DCS Subsystem performed nominally during this report period, continuing message collection at substantially the same rate.

Figure 18-1 shows the number of DCS messages received in each 18-day cycle at OCC, and the percentages of good messages for each cycle. The large number of messages shown for February was due to an accidental mode selection for one of the ground transmitters, DCP-6402.

There are 45 users in the data base. 246 DCP's have been shipped with 242 in the data base. The number of active DCP's per day averaged 103, a normal number.

Table 18-1 shows telemetry values since launch. All are nominal.

Table 18-1. DCS Telemetry Values

Func. No.	Name	Orbits						
		5	2462	5091	6362	6761	7210	7641
16001	Receiver 1 Sig Strength (DBM)*	-123.34	-124.81	-122.02	-125.00	-122.35	-122.84	-123.16
16002	Receiver 1 Temp (DGC)	22.54	24.20	24.37	23.51	25.18	25.07	25.12
16003	Rec-1 Pwr Input Volt (VDC)	2.35	2.36	2.36	2.35	2.37	2.37	2.37
16004	Receiver 2 Sig Volt (DBM)	F	F	F	F	F	F	F
16005	Receiver 2 Temp (DGC)	F	F	F	F	F	F	F
16006	Receiver 2 Input Volt (VDC)	F	F	F	F	F	F	F

*This value is for a CW carrier only; it is not valid during DCS message reception
F = Receiver 2 was OFF

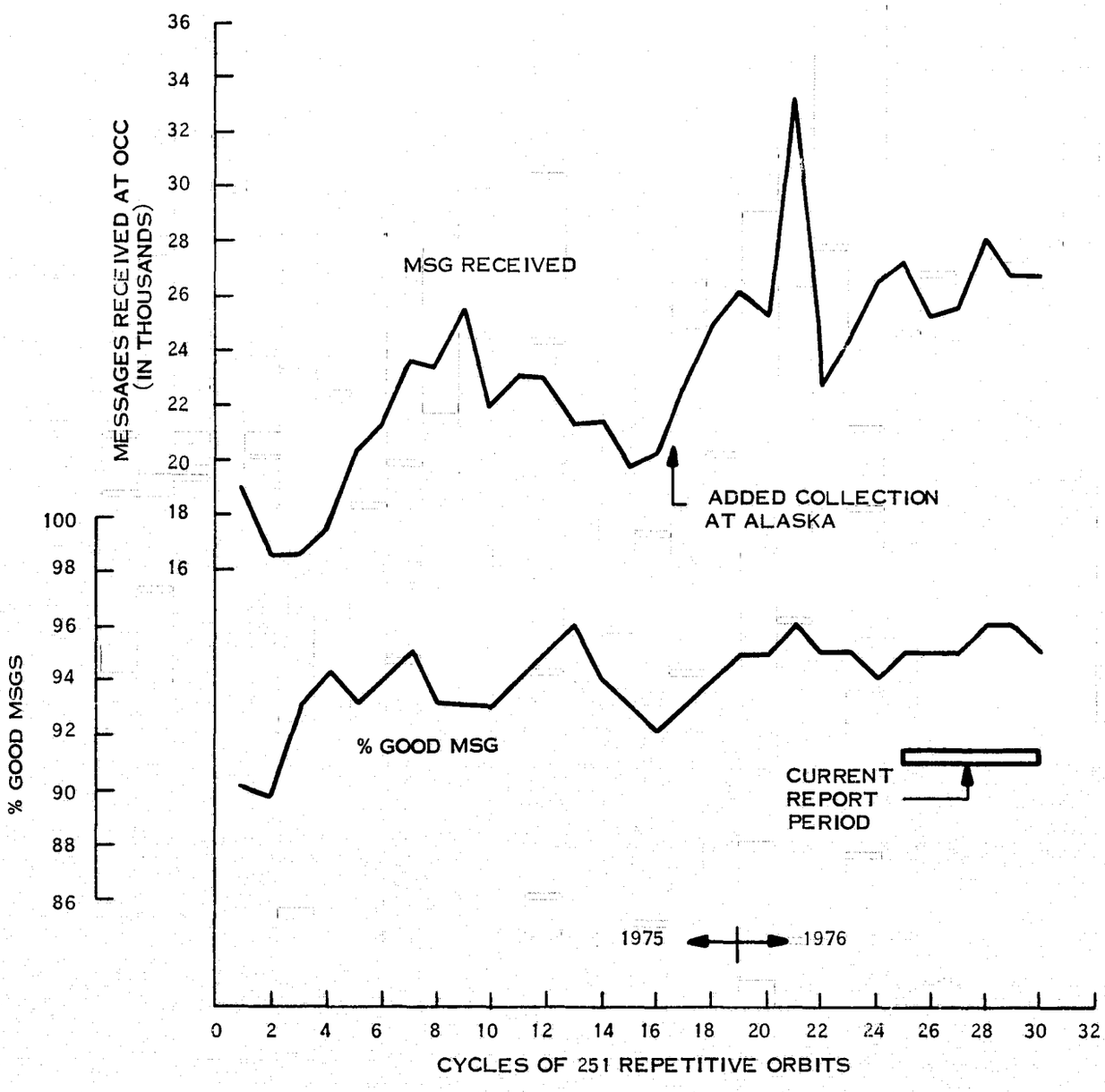


Figure 18-1. DCS Message History

Landsat-2 Anomalies and Observations

Date	Anomaly/Observation	How Observed	Comments
Prelaunch	Forward Scanner Pressure Leak	Spacecraft Integration	Before launch pressure increased. After launch pressure decreased. No anticipated effect on Scanner or S/C mission.
Prelaunch	Defective TLM Functions 1264, 4002, 13200	Spacecraft Integration	Functions are temperatures which are noncritical. Sensors failed prior to launch. Mission unaffected.
3/8/75	Unencoded command 781, CIU Channel B Off, received by spacecraft from RF Interference. Commands 782 or 786, switch comdecs; and commands 780 or 784, switch PWM regulator, received at other times.	On-Line	Non-Landsat OCC Authorized Unencoded commands received in Orbit 619, 640, 743, 1575, 1700, 2605, 3164, 5025.
3/17/75	MMCA Pitch Flux Density TLM Drift	Off-Line	Telemetry decreased 5 counts and indicates increase flux density on charged magnet. Probable sensor drift. No apparent effect on S/C performance.
4/5/75	WBVTR-1 Rewind Failure (MDR E01252)	On-Line	WBVTR-1 failed to execute Rewind command or prematurely terminated rewinds due to false BOT signal. Subsequent commands or Fool-Logic techniques allowed return to operation. Investigation Committee report issued. Problems occurred Orbit 1021, 1532, 1568, 2238. Operation restricted to 300 thru 1500 feet.
6/9/75	WBVTR-2 had Short Rewind (MDR E01255)	On-Line	WBVTR-2 started rewind but stopped prematurely in Orbit 1919 and again in Orbit 3854. Investigation Committee did not define a probable cause but assigned a momentary False BOT as reason for short rewind. Unit remains operational.
8/3/75	WBVTR-1 data did not provide sync to ground station (MDR D04930)	On-Line	One head circuit of WBVTR-1 failed to operate. 25% of data lost in data stream. Operation discontinued.
11/14/75	MSS False End-of-Line Codes (MDR D04940)	Off-Line	Occasional End-of-Line codes occurring in preamble or along video data. Creates 4 black and 4 white words in scene data. Occurs over magnetic anomalies with low incidence rate.
1/25/76	Solar Array Current Notch (MDR D04934)	On-Line	In Orbit 5123, abnormal drops in solar array current appeared for portion of satellite day. S/C operation unaffected because solar array has excess power to date.
7/20/76	Battery 6 Turned Off	Realtime & Off-Line	Battery 6 decreased in load share and rose in charge share thereby causing overcharge. Temperature increased and unit was turned off in orbit 7601.

LANDSAT-2

SPACECRAFT ORBIT REFERENCE TABLES

FROM JANUARY 1976 THROUGH DECEMBER 1977

ORBITS 4787 THROUGH 14980

FLIGHT DAY 344 THROUGH 1074

LANDSAT-2

JAN. 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	1	344	4787- 4800	210-223	16	18
2	2	345	4801- 4814	224-237	17	18
3	3	346	4815- 4828	238-251	18	18
4	4	347	4829- 4842	1- 14	1	19
5	5	348	4843- 4856	15- 28	2	19
6	6	349	4857- 4870	29- 42	3	19
7	7	350	4871- 4884	43- 56	4	19
8	8	351	4885- 4898	57- 70	5	19
9	9	352	4899- 4912	71- 84	6	19
10	10	353	4913- 4926	85- 98	7	19
11	11	354	4927- 4940	99-112	8	19
12	12	355	4941- 4954	113-126	9	19
13	13	356	4955- 4967	127-139	10	19
14	14	357	4968- 4981	140-153	11	19
15	15	358	4982- 4995	154-167	12	19
16	16	359	4996- 5009	168-181	13	19
17	17	360	5010- 5023	182-195	14	19
18	18	361	5024- 5037	196-209	15	19
19	19	362	5038- 5051	210-223	16	19
20	20	363	5052- 5065	224-237	17	19
21	21	364	5066- 5079	238-251	18	19
22	22	365	5080- 5093	1- 14	1	20
23	23	366	5094- 5107	15- 28	2	20
24	24	367	5108- 5121	29- 42	3	20
25	25	368	5122- 5135	43- 56	4	20
26	26	369	5136- 5149	57- 70	5	20
27	27	370	5150- 5163	71- 84	6	20
28	28	371	5164- 5177	85- 98	7	20
29	29	372	5178- 5191	99-112	8	20
30	30	373	5192- 5205	113-126	9	20
31	31	374	5206- 5218	127-139	10	20

LANDSAT-2

FEB, 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	32	375	5219- 5232	140-153	11	20
2	33	376	5233- 5246	154-167	12	20
3	34	377	5247- 5260	168-181	13	20
4	35	378	5261- 5274	182-195	14	20
5	36	379	5275- 5288	196-209	15	20
6	37	380	5289- 5302	210-223	16	20
7	38	381	5303- 5316	224-237	17	20
8	39	382	5317- 5330	238-251	18	20
9	40	383	5331- 5344	1- 14	1	21
10	41	384	5345- 5358	15- 28	2	21
11	42	385	5359- 5372	29- 42	3	21
12	43	386	5373- 5386	43- 56	4	21
13	44	387	5387- 5400	57- 70	5	21
14	45	388	5401- 5414	71- 84	6	21
15	46	389	5415- 5428	85- 98	7	21
16	47	390	5429- 5442	99-112	8	21
17	48	391	5443- 5456	113-126	9	21
18	49	392	5457- 5469	127-139	10	21
19	50	393	5470- 5483	140-153	11	21
20	51	394	5484- 5497	154-167	12	21
21	52	395	5498- 5511	168-181	13	21
22	53	396	5512- 5525	182-195	14	21
23	54	397	5526- 5539	196-209	15	21
24	55	398	5540- 5553	210-223	16	21
25	56	399	5554- 5567	224-237	17	21
26	57	400	5568- 5581	238-251	18	21
27	58	401	5582- 5595	1- 14	1	22
28	59	402	5596- 5609	15- 28	2	22
29	60	403	5610- 5623	29- 42	3	22

LANDSAT-2

MAR, 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	61	404	5624- 5637	43- 56	4	22
2	62	405	5638- 5651	57- 70	5	22
3	63	406	5652- 5665	71- 84	6	22
4	64	407	5666- 5679	85- 98	7	22
5	65	408	5680- 5693	99-112	8	22
6	66	409	5694- 5707	113-126	9	22
7	67	410	5708- 5720	127-139	10	22
8	68	411	5721- 5734	140-153	11	22
9	69	412	5735- 5748	154-167	12	22
10	70	413	5749- 5762	168-181	13	22
11	71	414	5763- 5776	182-195	14	22
12	72	415	5777- 5790	196-209	15	22
13	73	416	5791- 5804	210-223	16	22
14	74	417	5805- 5818	224-237	17	22
15	75	418	5819- 5832	238-251	18	22
16	76	419	5833- 5846	1- 14	1	23
17	77	420	5847- 5860	15- 28	2	23
18	78	421	5861- 5874	29- 42	3	23
19	79	422	5875- 5888	43- 56	4	23
20	80	423	5889- 5902	57- 70	5	23
21	81	424	5903- 5916	71- 84	6	23
22	82	425	5917- 5930	85- 98	7	23
23	83	426	5931- 5944	99-112	8	23
24	84	427	5945- 5958	113-126	9	23
25	85	428	5959- 5971	127-139	10	23
26	86	429	5972- 5985	140-153	11	23
27	87	430	5986- 5999	154-167	12	23
28	88	431	6000- 6013	168-181	13	23
29	89	432	6014- 6027	182-195	14	23
30	90	433	6028- 6041	196-209	15	23
31	91	434	6042- 6055	210-223	16	23

LANDSAT-2

APR. 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	92	435	6056- 6069	224-237	17	23
2	93	436	6070- 6083	238-251	18	23
3	94	437	6084- 6097	1- 14	1	24
4	95	438	6098- 6111	15- 28	2	24
5	96	439	6112- 6125	29- 42	3	24
6	97	440	6126- 6139	43- 56	4	24
7	98	441	6140- 6153	57- 70	5	24
8	99	442	6154- 6167	71- 84	6	24
9	100	443	6168- 6181	85- 98	7	24
10	101	444	6182- 6195	99-112	8	24
11	102	445	6196- 6209	113-126	9	24
12	103	446	6210- 6222	127-139	10	24
13	104	447	6223- 6236	140-153	11	24
14	105	448	6237- 6250	154-167	12	24
15	106	449	6251- 6264	168-181	13	24
16	107	450	6265- 6278	182-195	14	24
17	108	451	6279- 6292	196-209	15	24
18	109	452	6293- 6306	210-223	16	24
19	110	453	6307- 6320	224-237	17	24
20	111	454	6321- 6334	238-251	18	24
21	112	455	6335- 6348	1- 14	1	25
22	113	456	6349- 6362	15- 28	2	25
23	114	457	6363- 6376	29- 42	3	25
24	115	458	6377- 6390	43- 56	4	25
25	116	459	6391- 6404	57- 70	5	25
26	117	460	6405- 6418	71- 84	6	25
27	118	461	6419- 6432	85- 98	7	25
28	119	462	6433- 6446	99-112	8	25
29	120	463	6447- 6460	113-126	9	25
30	121	464	6461- 6473	127-139	10	25

LANDSAT-2

MAY, 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	122	465	6474- 6487	140-153	11	25
2	123	466	6488- 6501	154-167	12	25
3	124	467	6502- 6515	168-181	13	25
4	125	468	6516- 6529	182-195	14	25
5	126	469	6530- 6543	196-209	15	25
6	127	470	6544- 6557	210-223	16	25
7	128	471	6558- 6571	224-237	17	25
8	129	472	6572- 6585	238-251	18	25
9	130	473	6586- 6599	1- 14	1	26
10	131	474	6600- 6613	15- 28	2	26
11	132	475	6614- 6627	29- 42	3	26
12	133	476	6628- 6641	43- 56	4	26
13	134	477	6642- 6655	57- 70	5	26
14	135	478	6656- 6669	71- 84	6	26
15	136	479	6670- 6683	85- 98	7	26
16	137	480	6684- 6697	99-112	8	26
17	138	481	6698- 6711	113-126	9	26
18	139	482	6712- 6724	127-139	10	26
19	140	483	6725- 6738	140-153	11	26
20	141	484	6739- 6752	154-167	12	26
21	142	485	6753- 6766	168-181	13	26
22	143	486	6767- 6780	182-195	14	26
23	144	487	6781- 6794	196-209	15	26
24	145	488	6795- 6808	210-223	16	26
25	146	489	6809- 6822	224-237	17	26
26	147	490	6823- 6836	238-251	18	26
27	148	491	6837- 6850	1- 14	1	27
28	149	492	6851- 6864	15- 28	2	27
29	150	493	6865- 6878	29- 42	3	27
30	151	494	6879- 6892	43- 56	4	27
31	152	495	6893- 6906	57- 70	5	27

LANDSAT-2

JUNE 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	153	496	6907- 6920	71- 84	6	27
2	154	497	6921- 6934	85- 98	7	27
3	155	498	6935- 6948	99-112	8	27
4	156	499	6949- 6962	113-126	9	27
5	157	500	6963- 6975	127-139	10	27
6	158	501	6976- 6989	140-153	11	27
7	159	502	6990- 7003	154-167	12	27
8	160	503	7004- 7017	168-181	13	27
9	161	504	7018- 7031	182-195	14	27
10	162	505	7032- 7045	196-209	15	27
11	163	506	7046- 7059	210-223	16	27
12	164	507	7060- 7073	224-237	17	27
13	165	508	7074- 7087	238-251	18	27
14	166	509	7088- 7101	1- 14	1	28
15	167	510	7102- 7115	15- 28	2	28
16	168	511	7116- 7129	29- 42	3	28
17	169	512	7130- 7143	43- 56	4	28
18	170	513	7144- 7157	57- 70	5	28
19	171	514	7158- 7171	71- 84	6	28
20	172	515	7172- 7185	85- 98	7	28
21	173	516	7186- 7199	99-112	8	28
22	174	517	7200- 7213	113-126	9	28
23	175	518	7214- 7226	127-139	10	28
24	176	519	7227- 7240	140-153	11	28
25	177	520	7241- 7254	154-167	12	28
26	178	521	7255- 7268	168-181	13	28
27	179	522	7269- 7282	182-195	14	28
28	180	523	7283- 7296	196-209	15	28
29	181	524	7297- 7310	210-223	16	28
30	182	525	7311- 7324	224-237	17	28

LANDSAT-2

JUL, 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	183	526	7325- 7338	238-251	18	28
2	184	527	7339- 7352	1- 14	1	29
3	185	528	7353- 7366	15- 28	2	29
4	186	529	7367- 7380	29- 42	3	29
5	187	530	7381- 7394	43- 56	4	29
6	188	531	7395- 7408	57- 70	5	29
7	189	532	7409- 7422	71- 84	6	29
8	190	533	7423- 7436	85- 98	7	29
9	191	534	7437- 7450	99-112	8	29
10	192	535	7451- 7464	113-126	9	29
11	193	536	7465- 7477	127-139	10	29
12	194	537	7478- 7491	140-153	11	29
13	195	538	7492- 7505	154-167	12	29
14	196	539	7506- 7519	168-181	13	29
15	197	540	7520- 7533	182-195	14	29
16	198	541	7534- 7547	196-209	15	29
17	199	542	7548- 7561	210-223	16	29
18	200	543	7562- 7575	224-237	17	29
19	201	544	7576- 7589	238-251	18	29
20	202	545	7590- 7603	1- 14	1	30
21	203	546	7604- 7617	15- 28	2	30
22	204	547	7618- 7631	29- 42	3	30
23	205	548	7632- 7645	43- 56	4	30
24	206	549	7646- 7659	57- 70	5	30
25	207	550	7660- 7673	71- 84	6	30
26	208	551	7674- 7687	85- 98	7	30
27	209	552	7688- 7701	99-112	8	30
28	210	553	7702- 7715	113-126	9	30
29	211	554	7716- 7728	127-139	10	30
30	212	555	7729- 7742	140-153	11	30
31	213	556	7743- 7756	154-167	12	30

LANDSAT-2

AUG. 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	214	557	7757- 7770	168-181	13	30
2	215	558	7771- 7784	182-195	14	30
3	216	559	7785- 7798	196-209	15	30
4	217	560	7799- 7812	210-223	16	30
5	218	561	7813- 7826	224-237	17	30
6	219	562	7827- 7840	238-251	18	30
7	220	563	7841- 7854	1- 14	1	31
8	221	564	7855- 7868	15- 28	2	31
9	222	565	7869- 7882	29- 42	3	31
10	223	566	7883- 7896	43- 56	4	31
11	224	567	7897- 7910	57- 70	5	31
12	225	568	7911- 7924	71- 84	6	31
13	226	569	7925- 7938	85- 98	7	31
14	227	570	7939- 7952	99-112	8	31
15	228	571	7953- 7966	113-126	9	31
16	229	572	7967- 7979	127-139	10	31
17	230	573	7980- 7993	140-153	11	31
18	231	574	7994- 8007	154-167	12	31
19	232	575	8008- 8021	168-181	13	31
20	233	576	8022- 8035	182-195	14	31
21	234	577	8036- 8049	196-209	15	31
22	235	578	8050- 8063	210-223	16	31
23	236	579	8064- 8077	224-237	17	31
24	237	580	8078- 8091	238-251	18	31
25	238	581	8092- 8105	1- 14	1	32
26	239	582	8106- 8119	15- 28	2	32
27	240	583	8120- 8133	29- 42	3	32
28	241	584	8134- 8147	43- 56	4	32
29	242	585	8148- 8161	57- 70	5	32
30	243	586	8162- 8175	71- 84	6	32
31	244	587	8176- 8189	85- 98	7	32

LANDSAT-2

SEP, 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NB.
1	245	588	8190- 8203	99-112	8	32
2	246	589	8204- 8217	113-126	9	32
3	247	590	8218- 8230	127-139	10	32
4	248	591	8231- 8244	140-153	11	32
5	249	592	8245- 8258	154-167	12	32
6	250	593	8259- 8272	168-181	13	32
7	251	594	8273- 8286	182-195	14	32
8	252	595	8287- 8300	196-209	15	32
9	253	596	8301- 8314	210-223	16	32
10	254	597	8315- 8328	224-237	17	32
11	255	598	8329- 8342	238-251	18	32
12	256	599	8343- 8356	1- 14	1	33
13	257	600	8357- 8370	15- 28	2	33
14	258	601	8371- 8384	29- 42	3	33
15	259	602	8385- 8398	43- 56	4	33
16	260	603	8399- 8412	57- 70	5	33
17	261	604	8413- 8426	71- 84	6	33
18	262	605	8427- 8440	85- 98	7	33
19	263	606	8441- 8454	99-112	8	33
20	264	607	8455- 8468	113-126	9	33
21	265	608	8469- 8481	127-139	10	33
22	266	609	8482- 8495	140-153	11	33
23	267	610	8496- 8509	154-167	12	33
24	268	611	8510- 8523	168-181	13	33
25	269	612	8524- 8537	182-195	14	33
26	270	613	8538- 8551	196-209	15	33
27	271	614	8552- 8565	210-223	16	33
28	272	615	8566- 8579	224-237	17	33
29	273	616	8580- 8593	238-251	18	33
30	274	617	8594- 8607	1- 14	1	34

LANDSAT-2

OCT, 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	275	618	8608- 8621	15- 28	2	34
2	276	619	8622- 8635	29- 42	3	34
3	277	620	8636- 8649	43- 56	4	34
4	278	621	8650- 8663	57- 70	5	34
5	279	622	8664- 8677	71- 84	6	34
6	280	623	8678- 8691	85- 98	7	34
7	281	624	8692- 8705	99-112	8	34
8	282	625	8706- 8719	113-126	9	34
9	283	626	8720- 8732	127-139	10	34
10	284	627	8733- 8746	140-153	11	34
11	285	628	8747- 8760	154-167	12	34
12	286	629	8761- 8774	168-181	13	34
13	287	630	8775- 8788	182-195	14	34
14	288	631	8789- 8802	196-209	15	34
15	289	632	8803- 8816	210-223	16	34
16	290	633	8817- 8830	224-237	17	34
17	291	634	8831- 8844	238-251	18	34
18	292	635	8845- 8858	1- 14	1	35
19	293	636	8859- 8872	15- 28	2	35
20	294	637	8873- 8886	29- 42	3	35
21	295	638	8887- 8900	43- 56	4	35
22	296	639	8901- 8914	57- 70	5	35
23	297	640	8915- 8928	71- 84	6	35
24	298	641	8929- 8942	85- 98	7	35
25	299	642	8943- 8956	99-112	8	35
26	300	643	8957- 8970	113-126	9	35
27	301	644	8971- 8983	127-139	10	35
28	302	645	8984- 8997	140-153	11	35
29	303	646	8998- 9011	154-167	12	35
30	304	647	9012- 9025	168-181	13	35
31	305	648	9026- 9039	182-195	14	35

LANDSAT-2

NOV, 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	306	649	9040- 9053	196-209	15	35
2	307	650	9054- 9067	210-223	16	35
3	308	651	9068- 9081	224-237	17	35
4	309	652	9082- 9095	238-251	18	35
5	310	653	9096- 9109	1- 14	1	36
6	311	654	9110- 9123	15- 28	2	36
7	312	655	9124- 9137	29- 42	3	36
8	313	656	9138- 9151	43- 56	4	36
9	314	657	9152- 9165	57- 70	5	36
10	315	658	9166- 9179	71- 84	6	36
11	316	659	9180- 9193	85- 98	7	36
12	317	660	9194- 9207	99-112	8	36
13	318	661	9208- 9221	113-126	9	36
14	319	662	9222- 9234	127-139	10	36
15	320	663	9235- 9248	140-153	11	36
16	321	664	9249- 9262	154-167	12	36
17	322	665	9263- 9276	168-181	13	36
18	323	666	9277- 9290	182-195	14	36
19	324	667	9291- 9304	196-209	15	36
20	325	668	9305- 9318	210-223	16	36
21	326	669	9319- 9332	224-237	17	36
22	327	670	9333- 9346	238-251	18	36
23	328	671	9347- 9360	1- 14	1	37
24	329	672	9361- 9374	15- 28	2	37
25	330	673	9375- 9388	29- 42	3	37
26	331	674	9389- 9402	43- 56	4	37
27	332	675	9403- 9416	57- 70	5	37
28	333	676	9417- 9430	71- 84	6	37
29	334	677	9431- 9444	85- 98	7	37
30	335	678	9445- 9458	99-112	8	37

LANDSAT-2

DEC, 1976

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	336	679	9459- 9472	113-126	9	37
2	337	680	9473- 9485	127-139	10	37
3	338	681	9486- 9499	140-153	11	37
4	339	682	9500- 9513	154-167	12	37
5	340	683	9514- 9527	168-181	13	37
6	341	684	9528- 9541	182-195	14	37
7	342	685	9542- 9555	196-209	15	37
8	343	686	9556- 9569	210-223	16	37
9	344	687	9570- 9583	224-237	17	37
10	345	688	9584- 9597	238-251	18	37
11	346	689	9598- 9611	1- 14	1	38
12	347	690	9612- 9625	15- 28	2	38
13	348	691	9626- 9639	29- 42	3	38
14	349	692	9640- 9653	43- 56	4	38
15	350	693	9654- 9667	57- 70	5	38
16	351	694	9668- 9681	71- 84	6	38
17	352	695	9682- 9695	85- 98	7	38
18	353	696	9696- 9709	99-112	8	38
19	354	697	9710- 9723	113-126	9	38
20	355	698	9724- 9736	127-139	10	38
21	356	699	9737- 9750	140-153	11	38
22	357	700	9751- 9764	154-167	12	38
23	358	701	9765- 9778	168-181	13	38
24	359	702	9779- 9792	182-195	14	38
25	360	703	9793- 9806	196-209	15	38
26	361	704	9807- 9820	210-223	16	38
27	362	705	9821- 9834	224-237	17	38
28	363	706	9835- 9848	238-251	18	38
29	364	707	9849- 9862	1- 14	1	39
30	365	708	9863- 9876	15- 28	2	39
31	366	709	9877- 9890	29- 42	3	39

LANDSAT-2

JAN, 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	1	710	9891- 9904	43- 56	4	39
2	2	711	9905- 9918	57- 70	5	39
3	3	712	9919- 9932	71- 84	6	39
4	4	713	9933- 9946	85- 98	7	39
5	5	714	9947- 9960	99-112	8	39
6	6	715	9961- 9974	113-126	9	39
7	7	716	9975- 9987	127-139	10	39
8	8	717	9988-10001	140-153	11	39
9	9	718	10002-10015	154-167	12	39
10	10	719	10016-10029	168-181	13	39
11	11	720	10030-10043	182-195	14	39
12	12	721	10044-10057	196-209	15	39
13	13	722	10058-10071	210-223	16	39
14	14	723	10072-10085	224-237	17	39
15	15	724	10086-10099	238-251	18	39
16	16	725	10100-10113	1- 14	1	40
17	17	726	10114-10127	15- 28	2	40
18	18	727	10128-10141	29- 42	3	40
19	19	728	10142-10155	43- 56	4	40
20	20	729	10156-10169	57- 70	5	40
21	21	730	10170-10183	71- 84	6	40
22	22	731	10184-10197	85- 98	7	40
23	23	732	10198-10211	99-112	8	40
24	24	733	10212-10225	113-126	9	40
25	25	734	10226-10238	127-139	10	40
26	26	735	10239-10252	140-153	11	40
27	27	736	10253-10266	154-167	12	40
28	28	737	10267-10280	168-181	13	40
29	29	738	10281-10294	182-195	14	40
30	30	739	10295-10308	196-209	15	40
31	31	740	10309-10322	210-223	16	40

LANDSAT-2

FEB, 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	32	741	10323-10336	224-237	17	40
2	33	742	10337-10350	238-251	18	40
3	34	743	10351-10364	1- 14	1	41
4	35	744	10365-10378	15- 28	2	41
5	36	745	10379-10392	29- 42	3	41
6	37	746	10393-10406	43- 56	4	41
7	38	747	10407-10420	57- 70	5	41
8	39	748	10421-10434	71- 84	6	41
9	40	749	10435-10448	85- 98	7	41
10	41	750	10449-10462	99-112	8	41
11	42	751	10463-10476	113-126	9	41
12	43	752	10477-10489	127-139	10	41
13	44	753	10490-10503	140-153	11	41
14	45	754	10504-10517	154-167	12	41
15	46	755	10518-10531	168-181	13	41
16	47	756	10532-10545	182-195	14	41
17	48	757	10546-10559	196-209	15	41
18	49	758	10560-10573	210-223	16	41
19	50	759	10574-10587	224-237	17	41
20	51	760	10588-10601	238-251	18	41
21	52	761	10602-10615	1- 14	1	42
22	53	762	10616-10629	15- 28	2	42
23	54	763	10630-10643	29- 42	3	42
24	55	764	10644-10657	43- 56	4	42
25	56	765	10658-10671	57- 70	5	42
26	57	766	10672-10685	71- 84	6	42
27	58	767	10686-10699	85- 98	7	42
28	59	768	10700-10713	99-112	8	42

LANDSAT-2

MAR. 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	60	769	10714-10727	113-126	9	42
2	61	770	10728-10740	127-139	10	42
3	62	771	10741-10754	140-153	11	42
4	63	772	10755-10768	154-167	12	42
5	64	773	10769-10782	168-181	13	42
6	65	774	10783-10796	182-195	14	42
7	66	775	10797-10810	196-209	15	42
8	67	776	10811-10824	210-223	16	42
9	68	777	10825-10838	224-237	17	42
10	69	778	10839-10852	238-251	18	42
11	70	779	10853-10866	1- 14	1	43
12	71	780	10867-10880	15- 28	2	43
13	72	781	10881-10894	29- 42	3	43
14	73	782	10895-10908	43- 56	4	43
15	74	783	10909-10922	57- 70	5	43
16	75	784	10923-10936	71- 84	6	43
17	76	785	10937-10950	85- 98	7	43
18	77	786	10951-10964	99-112	8	43
19	78	787	10965-10978	113-126	9	43
20	79	788	10979-10991	127-139	10	43
21	80	789	10992-11005	140-153	11	43
22	81	790	11006-11019	154-167	12	43
23	82	791	11020-11033	168-181	13	43
24	83	792	11034-11047	182-195	14	43
25	84	793	11048-11061	196-209	15	43
26	85	794	11062-11075	210-223	16	43
27	86	795	11076-11089	224-237	17	43
28	87	796	11090-11103	238-251	18	43
29	88	797	11104-11117	1- 14	1	44
30	89	798	11118-11131	15- 28	2	44
31	90	799	11132-11145	29- 42	3	44

LANDSAT-2

APR, 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	91	800	11146-11159	43- 56	4	44
2	92	801	11160-11173	57- 70	5	44
3	93	802	11174-11187	71- 84	6	44
4	94	803	11188-11201	85- 98	7	44
5	95	804	11202-11215	99-112	8	44
6	96	805	11216-11229	113-126	9	44
7	97	806	11230-11242	127-139	10	44
8	98	807	11243-11256	140-153	11	44
9	99	808	11257-11270	154-167	12	44
10	100	809	11271-11284	168-181	13	44
11	101	810	11285-11298	182-195	14	44
12	102	811	11299-11312	196-209	15	44
13	103	812	11313-11326	210-223	16	44
14	104	813	11327-11340	224-237	17	44
15	105	814	11341-11354	238-251	18	44
16	106	815	11355-11368	1- 14	1	45
17	107	816	11369-11382	15- 28	2	45
18	108	817	11383-11396	29- 42	3	45
19	109	818	11397-11410	43- 56	4	45
20	110	819	11411-11424	57- 70	5	45
21	111	820	11425-11438	71- 84	6	45
22	112	821	11439-11452	85- 98	7	45
23	113	822	11453-11466	99-112	8	45
24	114	823	11467-11480	113-126	9	45
25	115	824	11481-11493	127-139	10	45
26	116	825	11494-11507	140-153	11	45
27	117	826	11508-11521	154-167	12	45
28	118	827	11522-11535	168-181	13	45
29	119	828	11536-11549	182-195	14	45
30	120	829	11550-11563	196-209	15	45

LANDSAT-2

MAY, 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	121	830	11564-11577	210-223	16	45
2	122	831	11578-11591	224-237	17	45
3	123	832	11592-11605	238-251	18	45
4	124	833	11606-11619	1- 14	1	46
5	125	834	11620-11633	15- 28	2	46
6	126	835	11634-11647	29- 42	3	46
7	127	836	11648-11661	43- 56	4	46
8	128	837	11662-11675	57- 70	5	46
9	129	838	11676-11689	71- 84	6	46
10	130	839	11690-11703	85- 98	7	46
11	131	840	11704-11717	99-112	8	46
12	132	841	11718-11731	113-126	9	46
13	133	842	11732-11744	127-139	10	46
14	134	843	11745-11758	140-153	11	46
15	135	844	11759-11772	154-167	12	46
16	136	845	11773-11786	168-181	13	46
17	137	846	11787-11800	182-195	14	46
18	138	847	11801-11814	196-209	15	46
19	139	848	11815-11828	210-223	16	46
20	140	849	11829-11842	224-237	17	46
21	141	850	11843-11856	238-251	18	46
22	142	851	11857-11870	1- 14	1	47
23	143	852	11871-11884	15- 28	2	47
24	144	853	11885-11898	29- 42	3	47
25	145	854	11899-11912	43- 56	4	47
26	146	855	11913-11926	57- 70	5	47
27	147	856	11927-11940	71- 84	6	47
28	148	857	11941-11954	85- 98	7	47
29	149	858	11955-11968	99-112	8	47
30	150	859	11969-11982	113-126	9	47
31	151	860	11983-11995	127-139	10	47

LANDSAT-2

JUNE 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	152	861	11996-12009	140-153	11	47
2	153	862	12010-12023	154-167	12	47
3	154	863	12024-12037	168-181	13	47
4	155	864	12038-12051	182-195	14	47
5	156	865	12052-12065	196-209	15	47
6	157	866	12066-12079	210-223	16	47
7	158	867	12080-12093	224-237	17	47
8	159	868	12094-12107	238-251	18	47
9	160	869	12108-12121	1- 14	1	48
10	161	870	12122-12135	15- 28	2	48
11	162	871	12136-12149	29- 42	3	48
12	163	872	12150-12163	43- 56	4	48
13	164	873	12164-12177	57- 70	5	48
14	165	874	12178-12191	71- 84	6	48
15	166	875	12192-12205	85- 98	7	48
16	167	876	12206-12219	99-112	8	48
17	168	877	12220-12233	113-126	9	48
18	169	878	12234-12246	127-139	10	48
19	170	879	12247-12260	140-153	11	48
20	171	880	12261-12274	154-167	12	48
21	172	881	12275-12288	168-181	13	48
22	173	882	12289-12302	182-195	14	48
23	174	883	12303-12316	196-209	15	48
24	175	884	12317-12330	210-223	16	48
25	176	885	12331-12344	224-237	17	48
26	177	886	12345-12358	238-251	18	48
27	178	887	12359-12372	1- 14	1	49
28	179	888	12373-12386	15- 28	2	49
29	180	889	12387-12400	29- 42	3	49
30	181	890	12401-12414	43- 56	4	49

LANDSAT-2

JUL , 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	182	891	12415-12428	57- 70	5	49
2	183	892	12429-12442	71- 84	6	49
3	184	893	12443-12456	85- 98	7	49
4	185	894	12457-12470	99-112	8	49
5	186	895	12471-12484	113-126	9	49
6	187	896	12485-12497	127-139	10	49
7	188	897	12498-12511	140-153	11	49
8	189	898	12512-12525	154-167	12	49
9	190	899	12526-12539	168-181	13	49
10	191	900	12540-12553	182-195	14	49
11	192	901	12554-12567	196-209	15	49
12	193	902	12568-12581	210-223	16	49
13	194	903	12582-12595	224-237	17	49
14	195	904	12596-12609	238-251	18	49
15	196	905	12610-12623	1- 14	1	50
16	197	906	12624-12637	15- 28	2	50
17	198	907	12638-12651	29- 42	3	50
18	199	908	12652-12665	43- 56	4	50
19	200	909	12666-12679	57- 70	5	50
20	201	910	12680-12693	71- 84	6	50
21	202	911	12694-12707	85- 98	7	50
22	203	912	12708-12721	99-112	8	50
23	204	913	12722-12735	113-126	9	50
24	205	914	12736-12748	127-139	10	50
25	206	915	12749-12762	140-153	11	50
26	207	916	12763-12776	154-167	12	50
27	208	917	12777-12790	168-181	13	50
28	209	918	12791-12804	182-195	14	50
29	210	919	12805-12818	196-209	15	50
30	211	920	12819-12832	210-223	16	50
31	212	921	12833-12846	224-237	17	50

LANDSAT-2

AUG. 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	213	922	12847-12860	238-251	18	50
2	214	923	12861-12874	1- 14	1	51
3	215	924	12875-12888	15- 28	2	51
4	216	925	12889-12902	29- 42	3	51
5	217	926	12903-12916	43- 56	4	51
6	218	927	12917-12930	57- 70	5	51
7	219	928	12931-12944	71- 84	6	51
8	220	929	12945-12958	85- 98	7	51
9	221	930	12959-12972	99-112	8	51
10	222	931	12973-12986	113-126	9	51
11	223	932	12987-12999	127-139	10	51
12	224	933	13000-13013	140-153	11	51
13	225	934	13014-13027	154-167	12	51
14	226	935	13028-13041	168-181	13	51
15	227	936	13042-13055	182-195	14	51
16	228	937	13056-13069	196-209	15	51
17	229	938	13070-13083	210-223	16	51
18	230	939	13084-13097	224-237	17	51
19	231	940	13098-13111	238-251	18	51
20	232	941	13112-13125	1- 14	1	52
21	233	942	13126-13139	15- 28	2	52
22	234	943	13140-13153	29- 42	3	52
23	235	944	13154-13167	43- 56	4	52
24	236	945	13168-13181	57- 70	5	52
25	237	946	13182-13195	71- 84	6	52
26	238	947	13196-13209	85- 98	7	52
27	239	948	13210-13223	99-112	8	52
28	240	949	13224-13237	113-126	9	52
29	241	950	13238-13250	127-139	10	52
30	242	951	13251-13264	140-153	11	52
31	243	952	13265-13278	154-167	12	52

LANDSAT-2

SEP, 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	244	953	13279-13292	168-181	13	52
2	245	954	13293-13306	182-195	14	52
3	246	955	13307-13320	196-209	15	52
4	247	956	13321-13334	210-223	16	52
5	248	957	13335-13348	224-237	17	52
6	249	958	13349-13362	238-251	18	52
7	250	959	13363-13376	1- 14	1	53
8	251	960	13377-13390	15- 28	2	53
9	252	961	13391-13404	29- 42	3	53
10	253	962	13405-13418	43- 56	4	53
11	254	963	13419-13432	57- 70	5	53
12	255	964	13433-13446	71- 84	6	53
13	256	965	13447-13460	85- 98	7	53
14	257	966	13461-13474	99-112	8	53
15	258	967	13475-13488	113-126	9	53
16	259	968	13489-13501	127-139	10	53
17	260	969	13502-13515	140-153	11	53
18	261	970	13516-13529	154-167	12	53
19	262	971	13530-13543	168-181	13	53
20	263	972	13544-13557	182-195	14	53
21	264	973	13558-13571	196-209	15	53
22	265	974	13572-13585	210-223	16	53
23	266	975	13586-13599	224-237	17	53
24	267	976	13600-13613	238-251	18	53
25	268	977	13614-13627	1- 14	1	54
26	269	978	13628-13641	15- 28	2	54
27	270	979	13642-13655	29- 42	3	54
28	271	980	13656-13669	43- 56	4	54
29	272	981	13670-13683	57- 70	5	54
30	273	982	13684-13697	71- 84	6	54

LANDSAT-2

OCT, 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	274	983	13698-13711	85- 98	7	54
2	275	984	13712-13725	99-112	8	54
3	276	985	13726-13739	113-126	9	54
4	277	986	13740-13752	127-139	10	54
5	278	987	13753-13766	140-153	11	54
6	279	988	13767-13780	154-167	12	54
7	280	989	13781-13794	168-181	13	54
8	281	990	13795-13808	182-195	14	54
9	282	991	13809-13822	196-209	15	54
10	283	992	13823-13836	210-223	16	54
11	284	993	13837-13850	224-237	17	54
12	285	994	13851-13864	238-251	18	54
13	286	995	13865-13878	1- 14	1	55
14	287	996	13879-13892	15- 28	2	55
15	288	997	13893-13906	29- 42	3	55
16	289	998	13907-13920	43- 56	4	55
17	290	999	13921-13934	57- 70	5	55
18	291	1000	13935-13948	71- 84	6	55
19	292	1001	13949-13962	85- 98	7	55
20	293	1002	13963-13976	99-112	8	55
21	294	1003	13977-13990	113-126	9	55
22	295	1004	13991-14003	127-139	10	55
23	296	1005	14004-14017	140-153	11	55
24	297	1006	14018-14031	154-167	12	55
25	298	1007	14032-14045	168-181	13	55
26	299	1008	14046-14059	182-195	14	55
27	300	1009	14060-14073	196-209	15	55
28	301	1010	14074-14087	210-223	16	55
29	302	1011	14088-14101	224-237	17	55
30	303	1012	14102-14115	238-251	18	55
31	304	1013	14116-14129	1- 14	1	56

LANDSAT-2

NOV, 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	305	1014	14130-14143	15- 28	2	56
2	306	1015	14144-14157	29- 42	3	56
3	307	1016	14158-14171	43- 56	4	56
4	308	1017	14172-14185	57- 70	5	56
5	309	1018	14186-14199	71- 84	6	56
6	310	1019	14200-14213	85- 98	7	56
7	311	1020	14214-14227	99-112	8	56
8	312	1021	14228-14241	113-126	9	56
9	313	1022	14242-14254	127-139	10	56
10	314	1023	14255-14268	140-153	11	56
11	315	1024	14269-14282	154-167	12	56
12	316	1025	14283-14296	168-181	13	56
13	317	1026	14297-14310	182-195	14	56
14	318	1027	14311-14324	196-209	15	56
15	319	1028	14325-14338	210-223	16	56
16	320	1029	14339-14352	224-237	17	56
17	321	1030	14353-14366	238-251	18	56
18	322	1031	14367-14380	1- 14	1	57
19	323	1032	14381-14394	15- 28	2	57
20	324	1033	14395-14408	29- 42	3	57
21	325	1034	14409-14422	43- 56	4	57
22	326	1035	14423-14436	57- 70	5	57
23	327	1036	14437-14450	71- 84	6	57
24	328	1037	14451-14464	85- 98	7	57
25	329	1038	14465-14478	99-112	8	57
26	330	1039	14479-14492	113-126	9	57
27	331	1040	14493-14505	127-139	10	57
28	332	1041	14506-14519	140-153	11	57
29	333	1042	14520-14533	154-167	12	57
30	334	1043	14534-14547	168-181	13	57

LANDSAT-2

DEC. 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	335	1044	14548-14561	182-195	14	57
2	336	1045	14562-14575	196-209	15	57
3	337	1046	14576-14589	210-223	16	57
4	338	1047	14590-14603	224-237	17	57
5	339	1048	14604-14617	238-251	18	57
6	340	1049	14618-14631	1- 14	1	58
7	341	1050	14632-14645	15- 28	2	58
8	342	1051	14646-14659	29- 42	3	58
9	343	1052	14660-14673	43- 56	4	58
10	344	1053	14674-14687	57- 70	5	58
11	345	1054	14688-14701	71- 84	6	58
12	346	1055	14702-14715	85- 98	7	58
13	347	1056	14716-14729	99-112	8	58
14	348	1057	14730-14743	113-126	9	58
15	349	1058	14744-14756	127-139	10	58
16	350	1059	14757-14770	140-153	11	58
17	351	1060	14771-14784	154-167	12	58
18	352	1061	14785-14798	168-181	13	58
19	353	1062	14799-14812	182-195	14	58
20	354	1063	14813-14826	196-209	15	58
21	355	1064	14827-14840	210-223	16	58
22	356	1065	14841-14854	224-237	17	58
23	357	1066	14855-14868	238-251	18	58
24	358	1067	14869-14882	1- 14	1	59
25	359	1068	14883-14896	15- 28	2	59
26	360	1069	14897-14910	29- 42	3	59
27	361	1070	14911-14924	43- 56	4	59
28	362	1071	14925-14938	57- 70	5	59
29	363	1072	14939-14952	71- 84	6	59
30	364	1073	14953-14966	85- 98	7	59
31	365	1074	14967-14980	99-112	8	59

APPENDIX C

LANDSAT-2 DOCUMENTS ISSUED THIS REPORT PERIOD

No.	Document No.	Title
1	PIR-1N23-ERTS-179	The Approximation of Landsat-2 Initial Oscillatory and Dampling Characteristics, dated 4/2/76
2	PIR-14N5-L2-184	Fourth Quarterly Test of RBV System, dated 5/20/76
3	PIR-1N25-L2-185	Quality of Record/Playback MSS Data, dated 6/8/76
4	PIR-1N25-L2-187	Accidental DCP Transmission Permit Evaluation of DSC Capacity, dated 6/22/76
5	PIR-1N25-L2-187	Landsat WBVTR Error History, dated 7/9/76