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AND ORBIT ADJUST OPERATION Evaluation  
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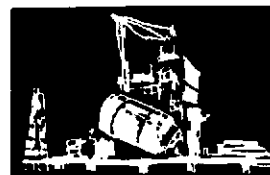
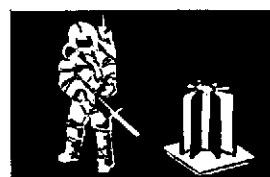
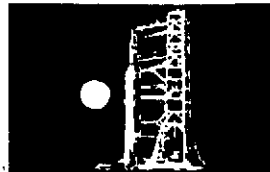
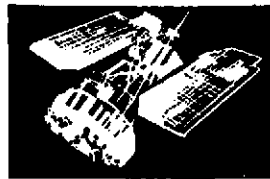
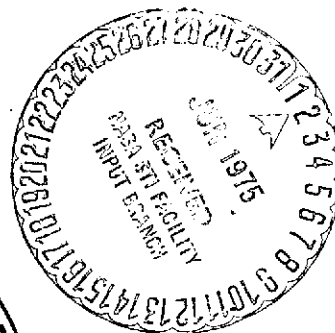
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**LANDSAT 2 LAUNCH AND FLIGHT ACTIVATION  
EVALUATION REPORT  
22 TO 26 JANUARY 1975  
LAUNCH THROUGH ORBIT 50  
AND ORBIT ADJUST OPERATION**

Prepared by  
**GE LANDSAT OPERATION CONTROL CENTER**

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



**GENERAL  ELECTRIC**

**Contract NAS5-21808**

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Approved:

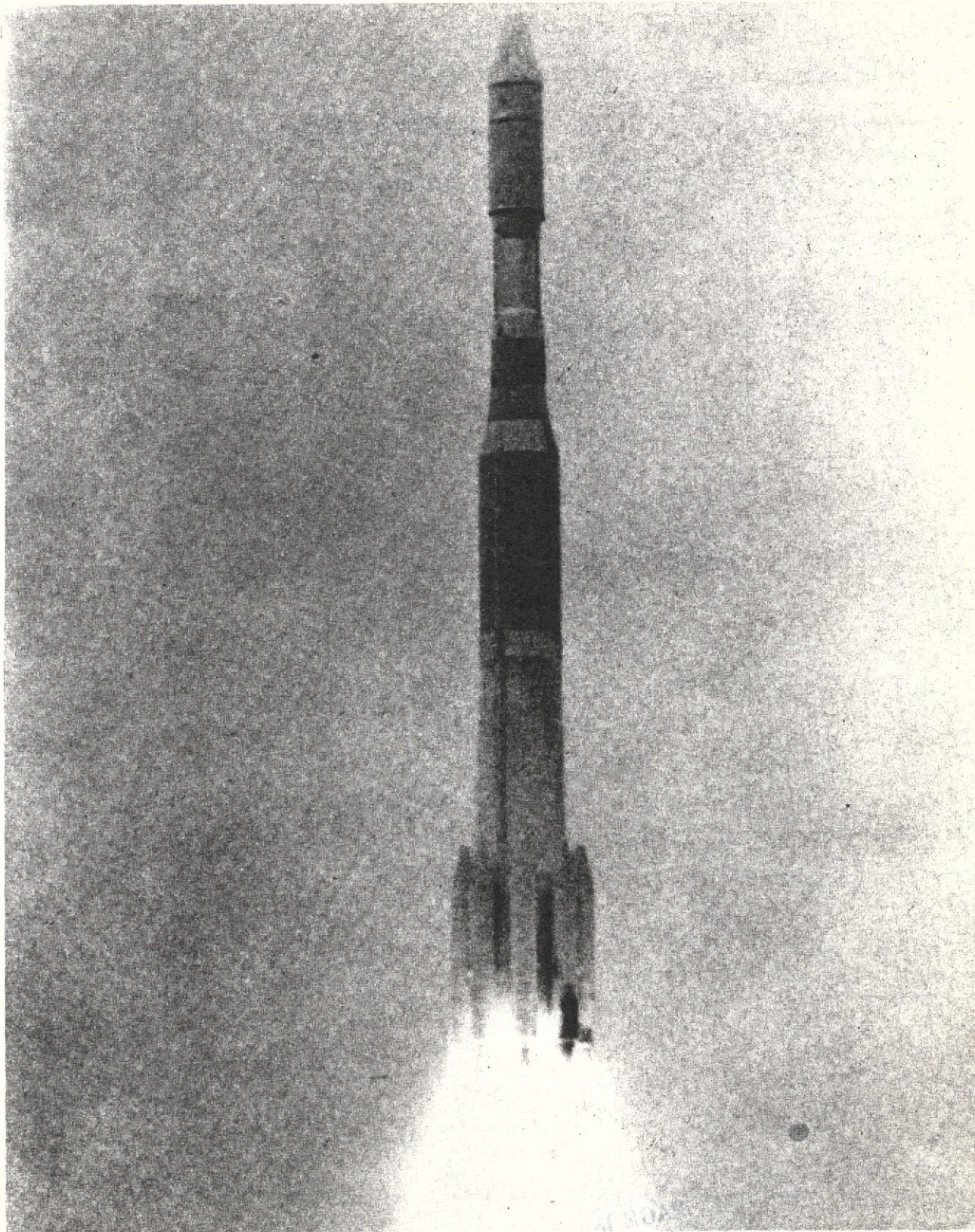


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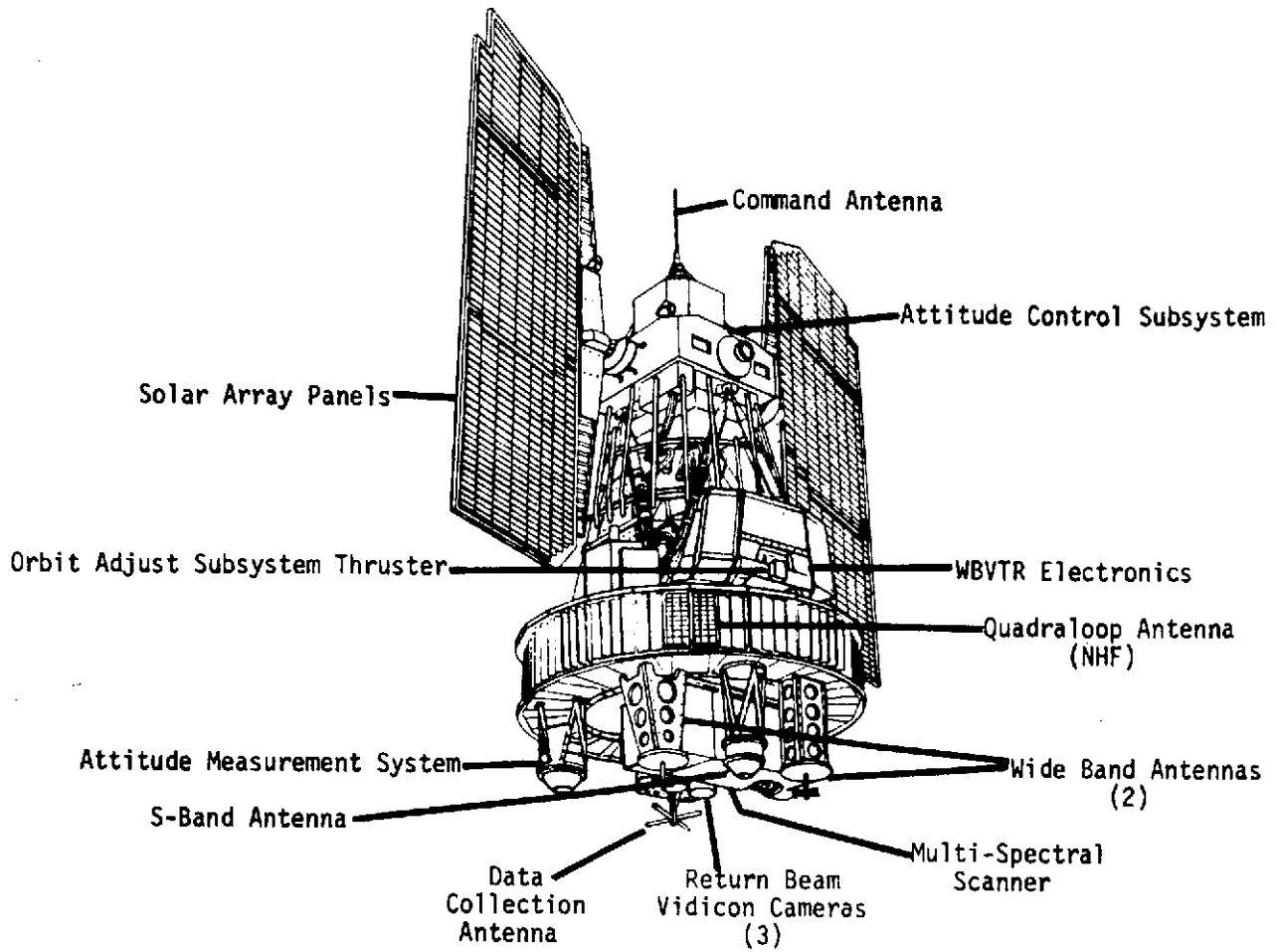
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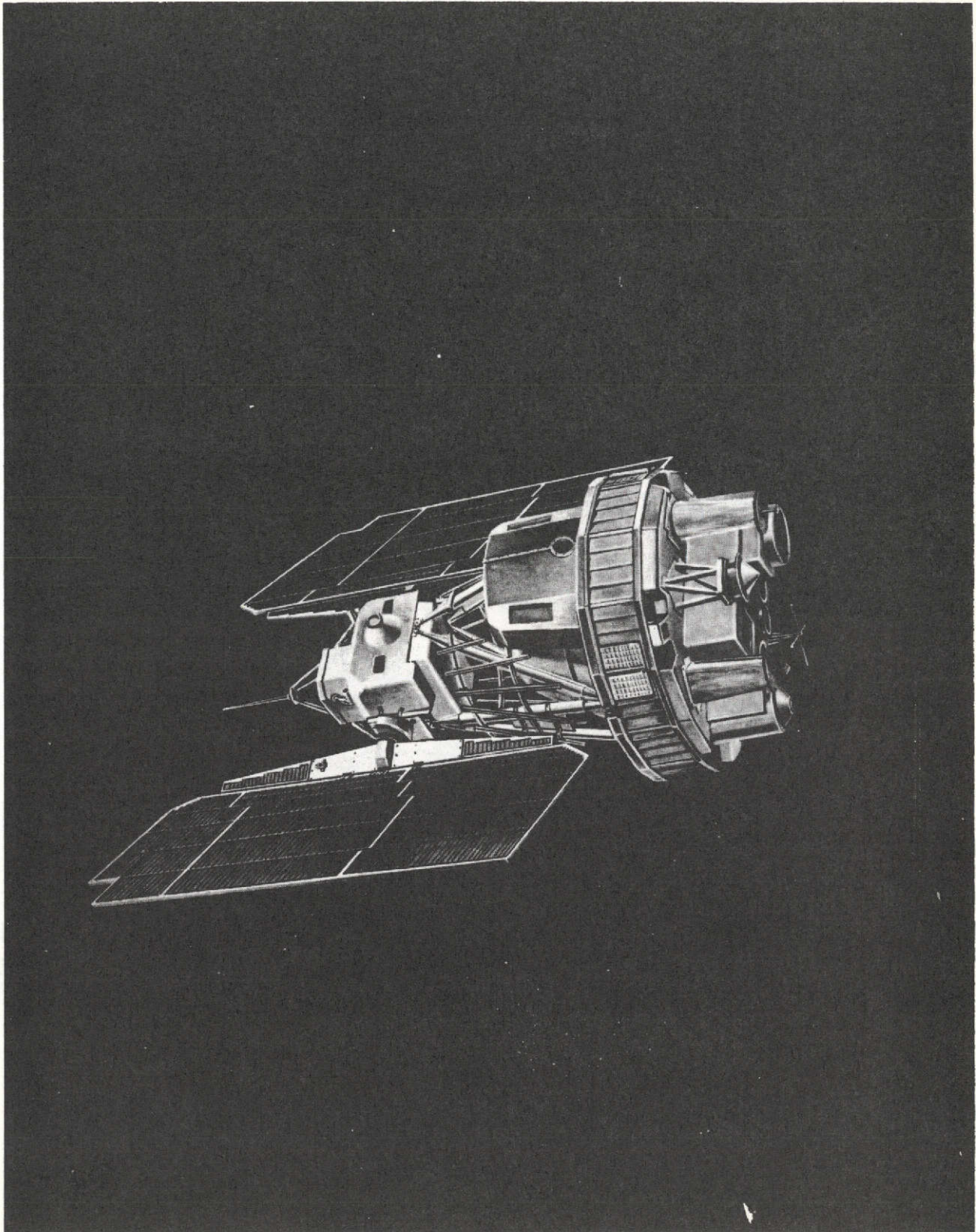


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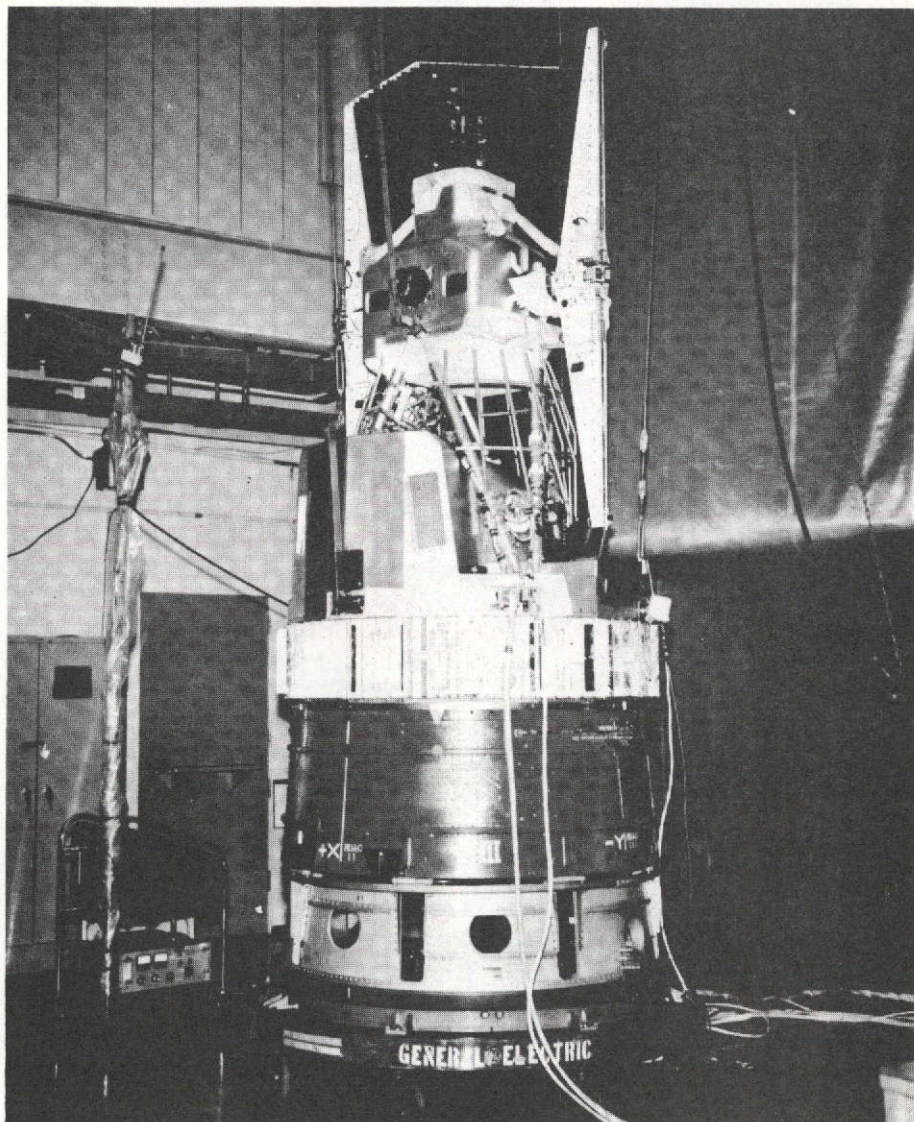


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**SECTION 1**

**INTRODUCTION**

## SECTION 1

### INTRODUCTION

This document contains the results of the analysis conducted on the telemetry data from the prelaunch, launch and flight activation phases of LANDSAT-2 spacecraft. It is presented by subsystem sections and provides for interrelationships as they exist between several subsystems. A brief statement of subsystem characteristics precedes flight evaluation statements. The appendix contains a total list of components flown on LANDSAT-2 and a complete listing of commands and telemetry functions for reference.

Flight data is compared to baseline data established at the 20<sup>0</sup>C plateau during thermal vacuum testing of the spacecraft. Evaluation guidelines were derived from the specifications developed from the LANDSAT program objectives, i. e., The primary mission objective of LANDSAT-2 is the acquisition of multispectral images of the surface of the earth. To accomplish this objective, two different types of multispectral sensors are used; a three camera return beam vidicon (RBV) system, and a four-channel multispectral scanner (MSS).

A secondary objective is the use of the LANDSAT-2 receiving, frequency translating, and transmitting equipment as a relay system to gather data from fixed earth-based sensor platforms which are operated by individual investigators.

Systematic, repetitive earth coverage under nearly constant observation conditions is required for maximum utility of the multispectral imagery to be collected by LANDSAT-2. A circular sun-synchronous orbit provides the optimum repetitive observations conditions.

LANDSAT-1 has been in orbit since July 23, 1972, and has its orbital parameters adjusted to make all descending equatorial crossings have the same sun angle, and to repeat the sub-vehicle earth trace every 251 orbits (18 days). LANDSAT-2 has essentially the same orbit, but is adjusted so that the combination of LANDSAT-1 and LANDSAT-2 provide repeat coverage of the sub-vehicle earth trace every 9 days.

The first 50 orbits are covered in this report.

**SECTION 2**

**SUMMARY**

SECTION 2  
SUMMARY - ORBITS 1-50

The LANDSAT-2 spacecraft was launched from the Western Test Range on 22 January 1975 at 022:17:55:51.604. The launch and orbital injection phase of the spaceflight were nominal and deployment of the spacecraft followed predictions.

POWER SUBSYSTEM (PWR)

After separation, the solar paddles deployed successfully, slewed to proper position, and began normal sun tracking. The array current averaged 14.7 amperes and reached a peak current of 15.8 amperes. Battery voltages were 33.2 VDC at max charge, and the end-of-night voltages were about 28.6 VDC. Battery temperatures averaged 19.0°C. All compensation and auxiliary loads completed checkout successfully. In Orbit 2 the shunt loads drew current, showing that the automatic shunt dissipators were operable.

ATTITUDE CONTROL SUBSYSTEM (ACS)

Following a nominal separation at 18:54:55 and subsequent stabilization, the ACS continued to operate normally. Roll, pitch, and yaw position and rates specification were met successfully. Existing levels of spacecraft disturbance torques resulted in an average of 1-2 gates of +R and 0-1 gates +P polarities per orbit. Analyses are continuing to evaluate the nature of the disturbances and to define subsequent compensation via the use of the Magnetic Moment Compensating Assembly (MMCA). The yaw mode was commanded to "normal" during interrogation 1 Alaska.

The overall performance of the ACS has been excellent.

COMMAND/CLOCK SUBSYSTEM (CMD)

All command functions have performed well. From separation of the spacecraft, real time, COMSTOR and ECAM commands have been executed in a timely and exact manner. All

difficulties associated with commanding have been directly relatable to acquisition/pointing and non-spacecraft problems.

#### TELEMETRY SUBSYSTEM (TLM)

Normal telemetry was consistently received with both the USB and VHF down links being exercised. All functions in the telemetry matrix are normal and within expected limits. All telemetry indicates that the spacecraft telemetry subsystem performance has been nominal.

#### ORBIT ADJUST SUBSYSTEM (OAS)

Health functions of the OAS were normal. In-plane orbital corrections were made by firing the -X and +X thrusters. The test burns on these thrusters lasted 4.8 seconds each and the longest burns were of 420 seconds duration. All operations were normal. Tracking data have confirmed the desired corrections. About 6.69 pounds of hydrazine were used during these maneuvers.

#### MAGNETIC MOMENT COMPENSATING ASSEMBLY (MMCA)

Telemetry function 4002 was defective prior to launch. Other health functions of the MMCA were normal. The unit was not activated during the period of this report. Insertion of dipole values was deferred pending evaluation of the ACS performance. ACS gating during this period has averaged less than one gate in the +R, -R and +P direction per orbit.

#### UNIFIED "S" BAND/PREMODULATION PROCESSOR (USBE)

The USBE functioned normally throughout this period. Carrier and subcarrier frequencies and formats were present for commands, telemetry, (1 kb real time and 24 kb playback) ranging, and data collection system transmissions. Power output was nominal.

## SEPARATION AND UNFOLD SUBSYSTEM (SUS)

The separation subsystem performed as expected. The 2.5 second timer initiated paddle unfold. Before separation the subsystem properly restrained the paddles, disabled the primary and redundant matrix A drivers, provided -24.5 VDC to the Attitude Control reset line, and provided telemetry signals indicating that the spacecraft was still mated to the Delta Vehicle. After separation all circuits were activated, separation was confirmed, and paddles were deployed properly. Both separation switches closed as expected.

## THERMAL SUBSYSTEM (THM)

The operation of the thermal subsystem in both the sensory ring and the ACS was within the expected limits at all locations. Average temperatures were: ACS baseplate 20.5°C, sensory ring 18.9°C, and center section 19.3°C. The shutter position average at Orbit 50 was 42.8°.

## ELECTRICAL INTERFACE SUBSYSTEM (EIS)

All EIS functions that were exercised during launch and activation were executed and confirmed. After launch, power switching was held to a minimum. Operation of time code processing, search track data processing, back-up timer operation, signal switching, and power switching was confirmed.

## NARROWBAND TAPE RECORDERS (NBTR)

Both NBTR's operated in a nominal manner. Both recorders were ON and recording during the launch phase. NBTR-1 was played back over Alaska in orbit 1. During orbit 2, both NBTR-1 and 2 were played back. Data was satisfactory and continued to be normal throughout this report period. Telemetry points on the recorders were normal.

## WIDEBAND TELEMETRY SUBSYSTEM (WBTS)

Both WB links were activated during Orbit 12 in the 10 watt mode. All subsystem telemetry data was normal. The high power mode (20 watts) was tested in Orbit 13, and all telemetry was normal. Carrier-to-noise ratio in the wideband ground receiver IF was measured as a function of satellite elevation angle and checked against the RF link budget. Both links agreed within 2 dB with calculated performance, and link margins appear more than adequate for all RBV and MSS data. Prelaunch RBV and MSS data were played back over the wideband links in Orbit 15, and all data appeared normal. MSS minor frame sync errors measured were the same as measured prior to launch. (5 errors per 10 seconds at Goldstone). Both wideband RF links, including receiving site equipment, performed as predicted throughout this period.

## ATTITUDE MEASUREMENT SENSOR (AMS)

The AMS power was applied during Orbit 6, and the unit has performed as expected since then. ACS fine control agrees with AMS output.

## WIDEBAND VIDEO TAPE RECORDERS (WBVTR)

Both recorders were OFF and at mid-tape position during launch. During Orbit 5, the recorders were rewound in preparation for playing back of data recorded prior to launch.

In Orbit 15, prelaunch RBV data from WBVTR1 and MSS data from WBVTR2 were played back, and all data was good. MSS Sun Cal data was recorded on WBVTR2 in Orbit 21 and playbacks of prelaunch recorded data was made on both WBVTR's. WBVTR2 telemetry values and MFSE counts were nominal.



### RETURN BEAM VIDICON (RBV)

The RBV subsystem was activated over Greenbelt during Orbits 40 and 41. All cameras were turned on, each operating separately and then all together. Telemetry values and MFSE counts were nominal.

The RBV was not operated again during this report period.

### MULTI-SPECTRAL SCANNER (MSS)

The MSS was activated over Goldstone during Orbit 19. All operations were nominal. During Orbit 21, a sun cal occurred over Alaska. Subsequent to activation the MSS scanned 54 R/T scenes (185 KM x 185 KM) through Orbit 50, each consisting of images from 4 spectral bands obtained from the United States.

### DATA COLLECTION SYSTEM (DCS)

The DCS receiver was powered during Orbit 5, and the DCS system received and re-transmitted the normal number of messages. Telemetry was nominal.

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**SECTION 3**  
**SPACECRAFT ACTIVATION SEQUENCE**

### SECTION 3

#### SPACECRAFT ACTIVATION SEQUENCE

The following paragraphs describe the activation sequence for the Spacecraft through Orbit 50. This sequence is subdivided by orbit and interrogation. For each interrogation, the stations and activities are listed. Only initial activations with associated times are shown. All subsequent commanding was normal.

##### Prelaunch (WTR, OCC)

1. Start NBTR2 in record at 17:23:51 GMT
2. Start NBTR1 in record at 17:28:37 GMT
3. Switch to internal power at 17:42:00 GMT

##### Orbit O/1 (WTR, WINKFIELD, TAN, MAD, ULA, HAW)

1. Lift off at 022:17:55:51.604
2. Separation at 18:54:55
3. Ascending Node 18:57:12
4. Confirmed Controls Stabilization of S/C, 18:56:01
5. Satellite Night to Day Transition 19:17:03
6. Enable USB Transmitters 18:57:36
7. Established Command Ability 19:10:02
8. USB Ranging ON 19:11:27
9. Playback of NBTR1 19:26:00
10. RMP-A, Low Motor Voltage 19:34:51

Orbit 2 (MAD, ULA, HAW, ACN)

1. Confirmed ability to turn auxiliary and compensation loads on and off. 21:05:53
2. Playback of NBTR2. 21:06:58

Orbit 3 (MAD, ULA, GWM)

1. Verified spacecraft status, stored and real time command capability.

Orbit 4 (ENT, ULA, GWM)

1. Verified spacecraft status, stored and real time command capability.

Orbit 5 (ENT, ULA)

1. Wideband Video-2 Recorder ON 01:59:08
2. Wideband Video-1 Recorder ON 01:59:15
3. WBVTR-2 Rewind 01:59:22
4. WBVTR-1 Rewind 01:59:22
5. WBVTR-2 OFF 02:01:20
6. WBVTR-1 OFF 02:01:21
7. DCS Receiver-1 ON 02:02:08

Orbit 6 (ENT, GDS, ULA)

1. Attitude Measurement Sensor ON 03:51:44

Orbit 7 (GDS, ULA)

1. Verified spacecraft status and command capability

Orbit 8 (HAW, ULA)

1. Verified spacecraft status and command capability

Orbit 9 (HAW, ULA)

1. Verified spacecraft status and command capability

Orbit 10 (MAD, ACN, GWM)

1. Verified spacecraft status and command capability

Orbit 11 (BDA)

1. Verified spacecraft status and command capability

Orbit 12 (ENT, ULA)

1. Wideband power amplifiers 1 and 2 ON 10 watts (no modulation) 14:29:31, OFF 14:36:53
2. Wideband frequency modulator inverter, ON 14:29:41, OFF 14:36:55

Orbit 13 (ENT, EGD)

1. Wideband power amplifier-1 ON 20 watts (no modulation) 16:10:39, OFF 16:17:55
2. Wideband power amplifier-2 ON 20 watts (no modulation) 16:10:37, OFF 16:17:53

Orbit 14 (ULA, EGD)

1. Enabled and configured RBV/MSS filters. Real time RBV data on filter A and real time 2 MSS data on filter B 17:56:28

2. Wideband power amplifiers 1 and 2 ON 17:58:37 , 20 watts. (WBPA reduced to 10 watts 18:06:23 - no modulation
3. WBPA's OFF 18:05:55

Orbit 15 (ULA)

1. WBVTR-1 Playback mode ON 19:32:06, OFF 19:51:44
2. WBVTR-2 Playback mode ON 19:34:20, OFF 19:51:44

Orbit 16 (ULA, MAD, HAW)

1. Verified spacecraft status and command capability

Orbit 17 (ACN, MAD, ULA, GWM)

1. Verified spacecraft status and command capability

Orbit 18 (GWM, ENT, ULA)

1. Verified spacecraft status and command capability

Orbit 19 (MIL, ENT, ULA)

1. Commanded MSS band and modes ON/OFF in sequence, then total system operated (including WBVTR-2 Rec) 02:15:12.

Orbit 20 (GDS, ULA, ENT)

1. Verified spacecraft status and command capability

Orbit 21 (GDS, ULA)

1. MSS System ON 05:38:44, Sun cal performed (WBVTR-2, ON; WBPA-2, ON)

Orbit 22 (ULA, HAW)

1. Verified spacecraft status and command capability

Orbit 23 (HAW, ULA, MAD, ACN, GWM)

1. Verified spacecraft status and command capability

Orbit 24 MAD, ACN, GWM)

1. Verified spacecraft status and command capability

Orbit 25 (BDA)

1. Verified spacecraft status and command capability

Orbit 26 (ENT, MIL)

1. Real time MSS operations

Orbit 27 (ENT, GDS)

1. Real time MSS operations

Orbit 28 (ULA, GDS)

1. Real time MSS operations

Orbit 29 (ULA, MAD, HAW)

1. Real time MSS operations
2. ECAM activated in the Load mode and Program mode

Orbit 30 (MAD, ULA, HAW, ACN)

1. ECAM A and load B

Orbit 31 (MAD, ULA, GWM)

1. Routine operations

Orbit 32 (ENT, ULA, GWM)

1. Orbit adjust - X thruster test at 00:34:00.8

Orbit 33 thru 39

1. Routine operations

Orbit 40 (ENT, BDA)

1. RBV initial turn ON-OFF

Orbit 41 (ENT, EGD)

1. RBV test on each camera and on all

Orbit 42 thru Orbit 44

1. Routine operations



Orbit 45 (MAD, ULA, GWM)

1. Switched to MSFN-B/STADAN A. USB-B and VHF-A now being used

Orbit 46 (ENT, ULA, GWM)

1. Routine operations

Orbit 47 (MIL, ENT, ULA)

1. Sun cal, MSS

Orbits 48 thru Orbit 50

1. Routine operations

**SECTION 4**  
**ORBITAL PARAMETERS**

SECTION 4  
ORBITAL PARAMETERS

The LANDSAT-2 spacecraft was launched from the Western Test Range in a Near Polar Orbit on 22 January 1975 at 17:55:51.604 z. The official international designation is 1975-4A and the mission tracking and telemetry number is 7500401.

Following are the Brouwer mean orbital elements for satellite 1975-4A (LANDSAT-2) computed and issued by the Goddard Space Flight Center.

Table 4-1. Elements of the Mission Orbit

|   | Planned              | Post Launch <sup>1</sup> | Post Orbit Adjusts <sup>2</sup> |
|---|----------------------|--------------------------|---------------------------------|
| 1. Apogee   | 907.7 km             | 915.03 km                | 916.84 km                       |
| 2. Perigee  | 907.7 km             | 901.56 km                | 898.47 km                       |
| 3. Inclination  | 99.098* deg          | 99.095 deg               | 99.096 deg                      |
| 4. Semi-major axis  | 7285.820* km         | 7286.462 km              | 7285.820 km                     |
| 5. Eccentricity   | 0.0001*              | 0.000925                 | 0.001260                        |
| 6. Anomalistic Period                                     | 103.152 min          | 103.165 min              | 103.1514 min                    |
| 7. Distance between adjacent ground tracks at the equator | 159.375 km           | 165.57 km                | 159.35 km                       |
| 8. Average cycle duration                                 | 18 days              | 18 days                  | 18 days                         |
| 9. Delta days in standard cycle (LANDSAT-1 and LANDSAT-2) | 9                    | 12                       | 9                               |
| 10. Phasing between LANDSAT-1 and-2                       | 135-225 <sup>o</sup> | 131.9 <sup>o</sup>       | 196.6 <sup>o</sup>              |

\*The 3-sigma uncertainties for the inclination, semimajor axis, and eccentricity are  $\pm 0.1$  deg,  $\pm 22.2$  or  $-24.1$  km and 0.002 respectively.

1 EPOCH 75 Y 01 m 250 at 00 hrs 34.00 min. U. T.

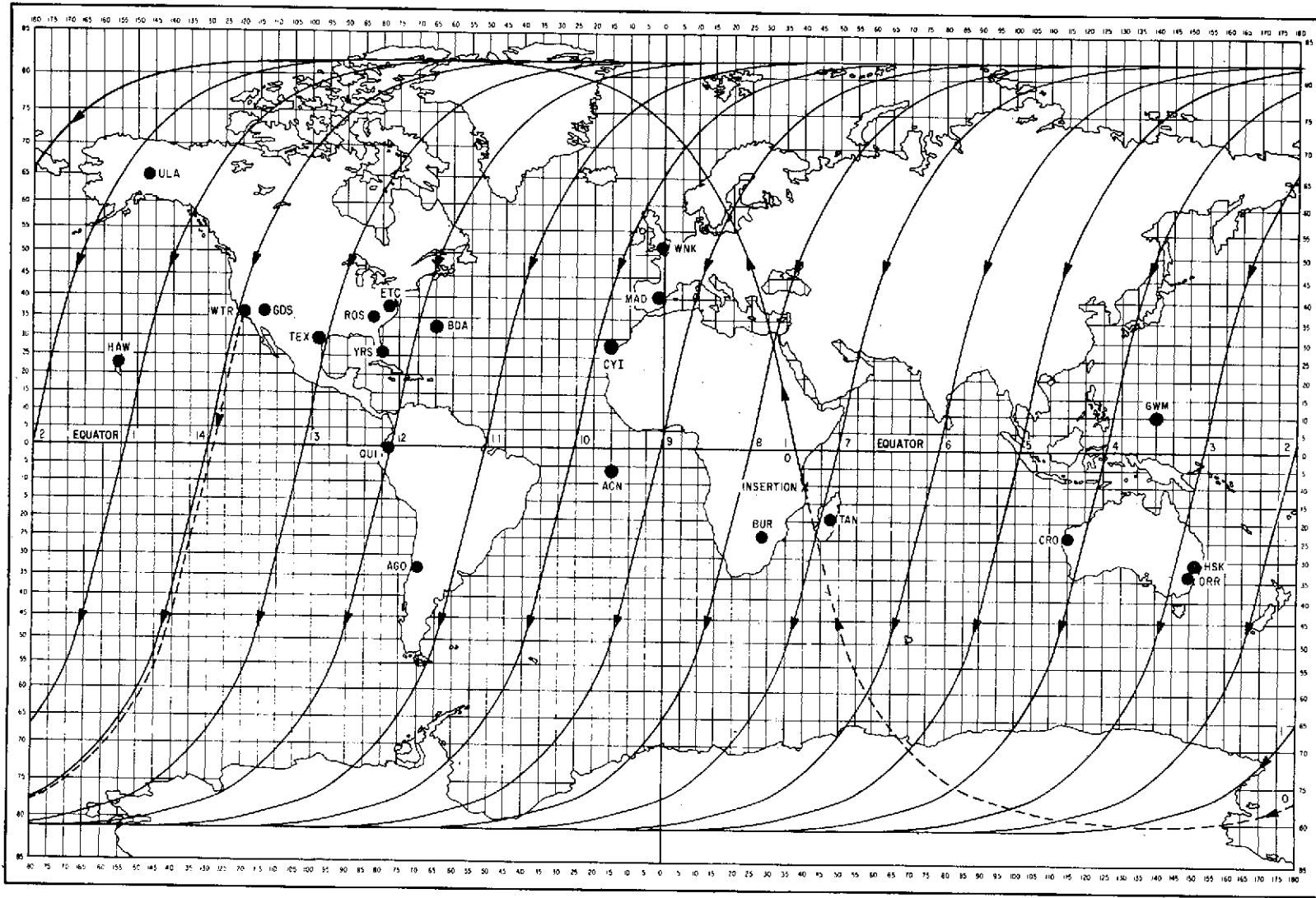
2 EPOCH 75 Y 02 m 060 at 22 hrs 36.00 min. U. T.

The mission requirement for LANDSAT-2 was to place the satellite in a sun synchronous orbit with 18 day ground track repeat cycle, and to phase it at an angle of 135 to 225<sup>o</sup> with LANDSAT-1.

Also required was a combined full coverage of the earth, using both LANDSAT-1 and LANDSAT-2, in 9 days. These requirements have been achieved satisfactorily with in-plane orbital corrections of LANDSAT-2 which placed the satellites 9 days apart in the 18 day ground track repeat cycle.

Figure 4-1 shows the first and subsequent orbit tracks of LANDSAT-2. All descending equatorial crossings occur at approximately 9:30 a.m. local time. All ascending crossings are in local darkness.

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Figure 4-1. Subsatellite Plot of the LANDSAT-2 Spacecraft

**SECTION 5**  
**POWER SUBSYSTEM**

SECTION 5

POWER SUBSYSTEM

The power subsystem includes two solar array platform assemblies to convert solar energy to electrical energy; eight storage modules to store electrical energy; one auxiliary load controller and two auxiliary load panels to dissipate excess electrical power; one power control module and one payload regulator module to regulate and distribute power. See Figure 5-1 for functional block diagram, and Figure 5-2 and Figure 5-3 for hardware illustration.

The power subsystem provides unregulated and regulated power to satisfy the electrical load requirements of the spacecraft. Unregulated power is supplied with a voltage range of -26 vdc to -37.5 vdc. The regulated power bus is  $-24.5 \pm 0.5$  vdc with an output dc impedance of 0.01 ohm and an output ac impedance of 0.1 ohm at frequencies up to 10 KHz. The power control module can deliver up to 20 amperes and the payload regulator module can deliver up to 26 amperes under these conditions.

The Power Subsystem was launched in the configuration shown in Table 5-1.

Table 5-1. Power Subsystem Launch Configuration

|            | MODE | CMD |            | MODE  | CMD |
|------------|------|-----|------------|-------|-----|
| BATT 1     | ON   | 353 | SHUNT LD D | ON    | 437 |
| BATT 2     |      |     | COMP LD 1  | OFF   | 355 |
| BATT 3     |      |     | COMP LD 2  |       |     |
| BATT 4     |      |     | COMP LD 3  |       |     |
| BATT 5     |      |     | COMP LD 4  |       |     |
| BATT 6     |      |     | COMP LD 5  |       |     |
| BATT 7     |      |     | COMP LD 6  |       |     |
| BATT 8     |      |     | COMP LD 7  |       |     |
| AUX LD 1   | OFF  | 374 | COMP LD 8  |       |     |
| AUX LD 2   |      |     | TR CHARGE  | ON    | 727 |
| AUX LD 3   |      |     | PRM        | ON    | 622 |
| AUX LD 4   |      |     | PRM FTAP   | EN    | 655 |
| AUX LD 5   |      |     | PSM BUSS   | ON    | 614 |
| SHUNT LD A | ON   | 437 | SW TMP PWR | REG 1 | SEL |
| SHUNT LD B |      |     | SPACECRAFT | REG 3 | SEL |
| SHUNT LD C |      |     | PAYLOAD    |       |     |

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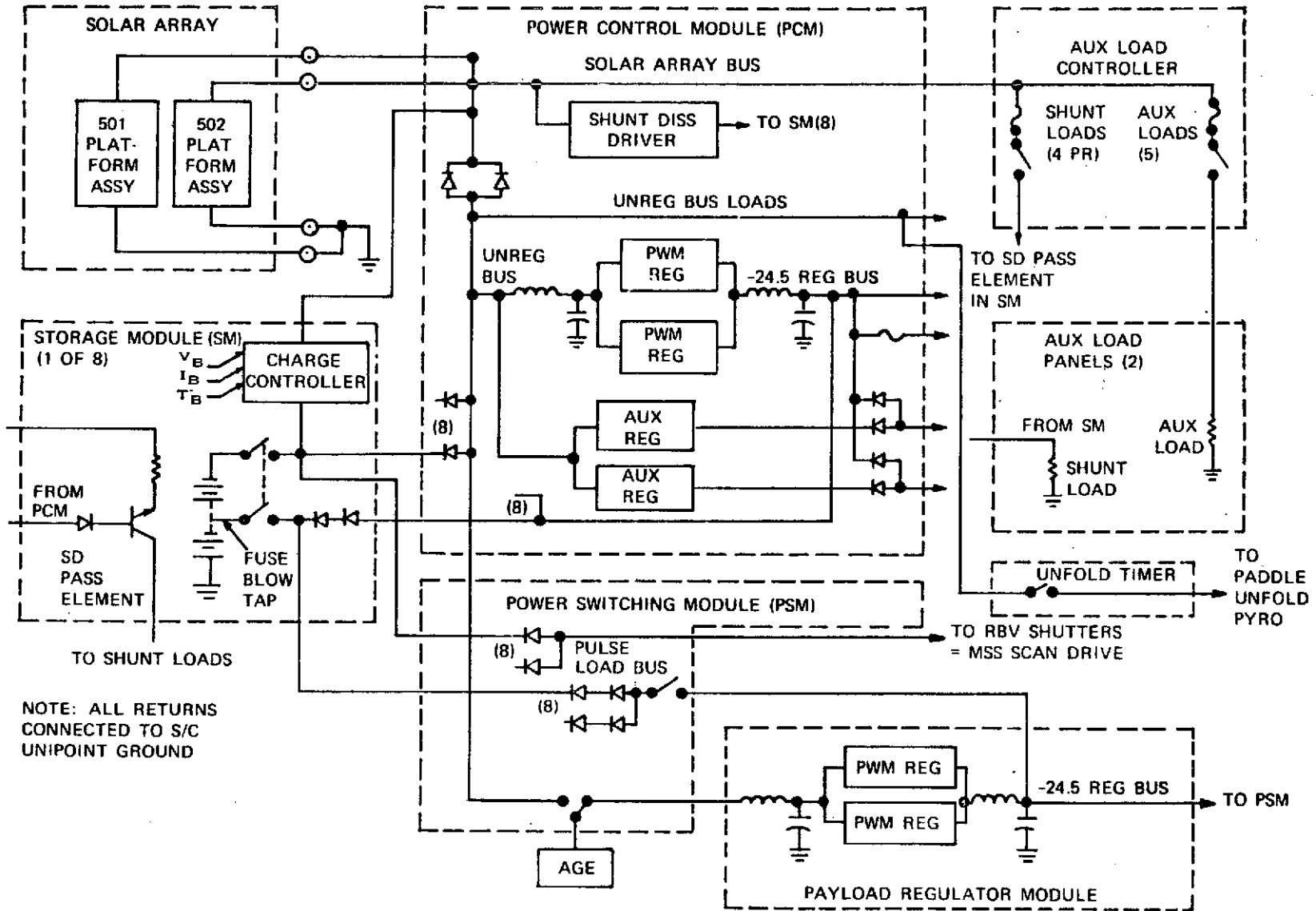


Figure 5-1. Functional Block Diagram, LANDSAT-2 Power Subsystem



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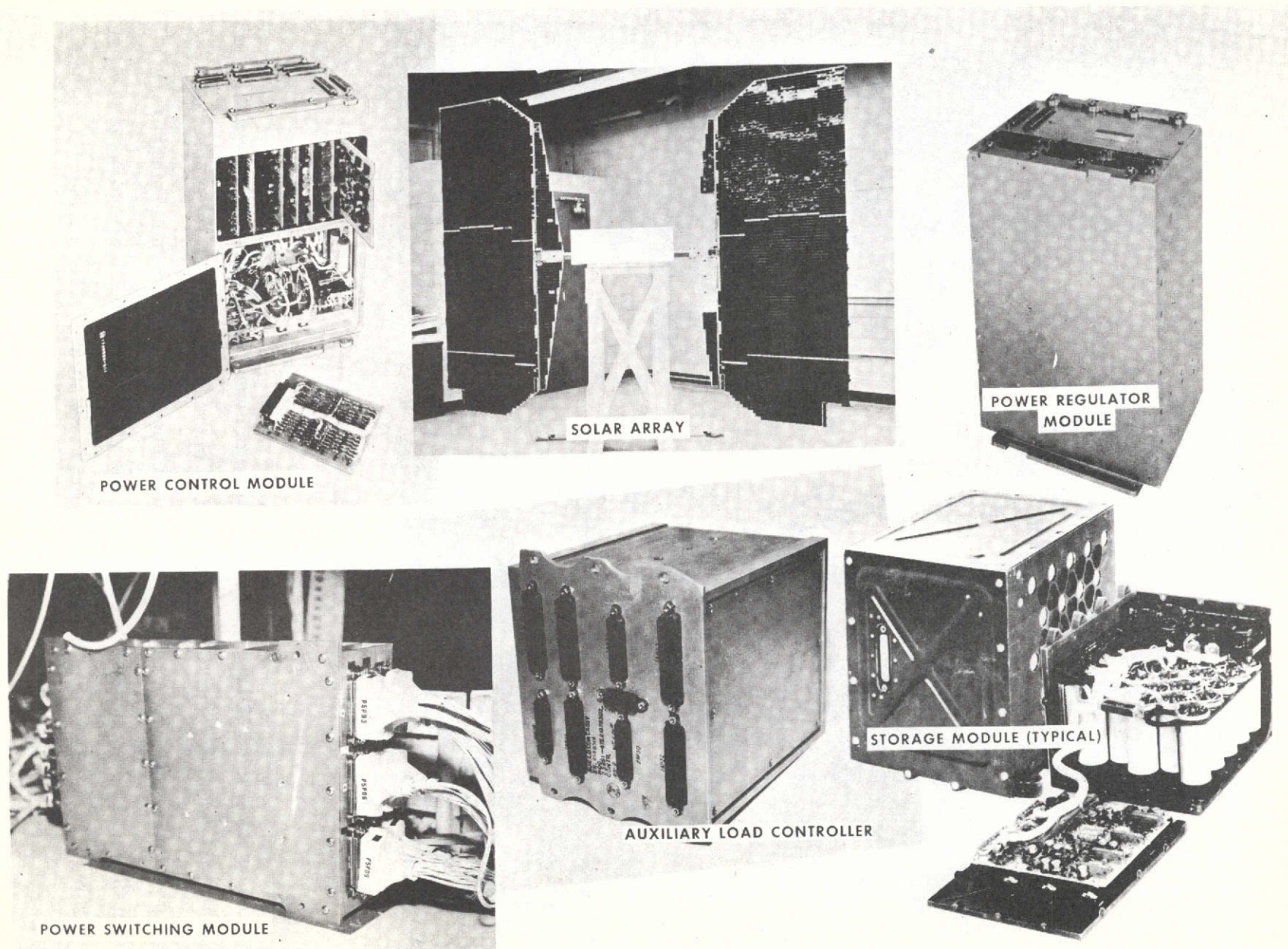


Figure 5-2. LANDSAT-2 Power Subsystem

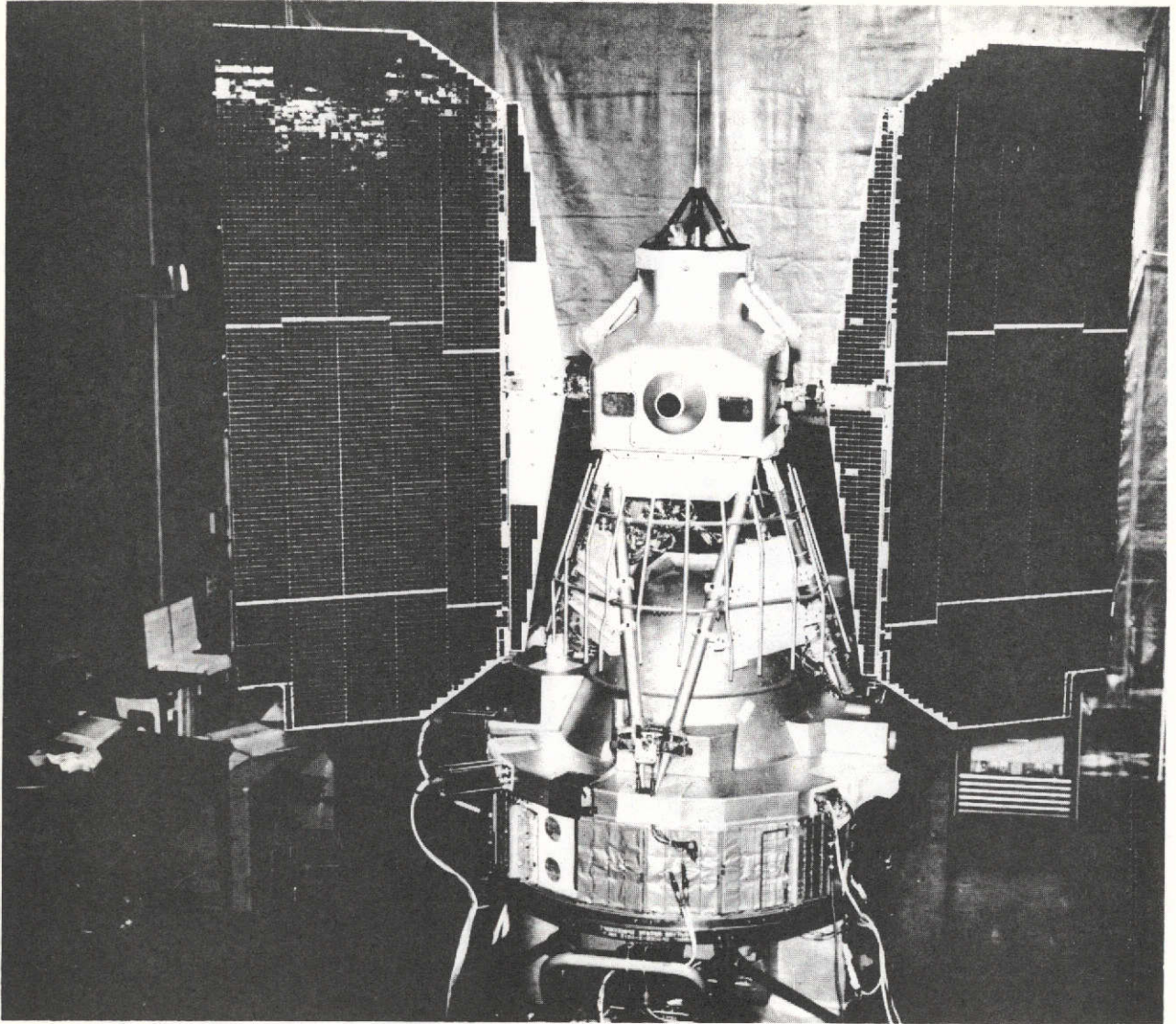


Figure 5-3. LANDSAT-2 Observatory Solar Array Deployment

#### Performance

The battery packs in the LANDSAT-2 power subsystem were on low level charge until 17:42:00 GMT when the spacecraft was switched to internal power prior to launch. The batteries powered the spacecraft for approximately one hour and 40 minutes until 19:21 GMT when the solar array current became high enough to supply the load and begin recharging the batteries. The maximum depth of discharge was 30.3%. The voltage was 29.6 at this point with a current of less than 50 milliamperes.

For comparison to LANDSAT-1 data, a time of 19:09:35 GMT was taken when the battery voltages were near their minimum voltage due to high currents and deep discharge. Table 5-2 shows this comparison. The higher current shows that the LANDSAT-2 data would have slightly higher voltages than LANDSAT-1 data if adjusted to the same conditions. The voltages are quite adequate to safely supply the LANDSAT-2 mission.

Table 5-2. Comparison of Battery Discharge Characteristics

| Spacecraft | Current Spread (Amperes) | Depth of Discharge (%) | Voltage Average (Volts) | Temperature Range (DGC) |
|------------|--------------------------|------------------------|-------------------------|-------------------------|
| LANDSAT-1  | 0.72-0.82                | 27.8                   | 28.21                   | 18.8-21.5               |
| LANDSAT-2  | 0.89-1.00                | 27.8                   | 28.29                   | 16.1-20.3               |

End of night voltages, average battery temperatures, and temperature spread between batteries is shown in Table 5-3. Battery performance is normal.

The solar drives were launched with both panels in the normal mode. After deployment at night the right solar panel began slewing to align itself normal to the sun (see Figure 5-4). The left panel sun sensor did not clear the albedo shield until approximately 7 minutes into day one at which time it also began slewing to align itself to the sun. Final alignment to the sun was not complete until near the end day in Orbit 2. Orbit 3 shows the normal solar array signature with its two shadow areas resulting from the sensory ring shadow on the right panel near sunrise and sunset; and earthshine implinging on the panels when they are jointly receiving direct energy from the sun and reflected sun energy from the earth. At midday there is no earthshine and the solar array had a current of 15.37<sup>a</sup> at an unregulated bus voltage of 31.9 volts. This point will be used to monitor solar array degradation in future reports. The Solar Array Average Energy was 1123 ampere-minutes in early orbits. Based on the above results the power subsystem is anticipated to fully support LANDSAT-2 mission with adequate power.

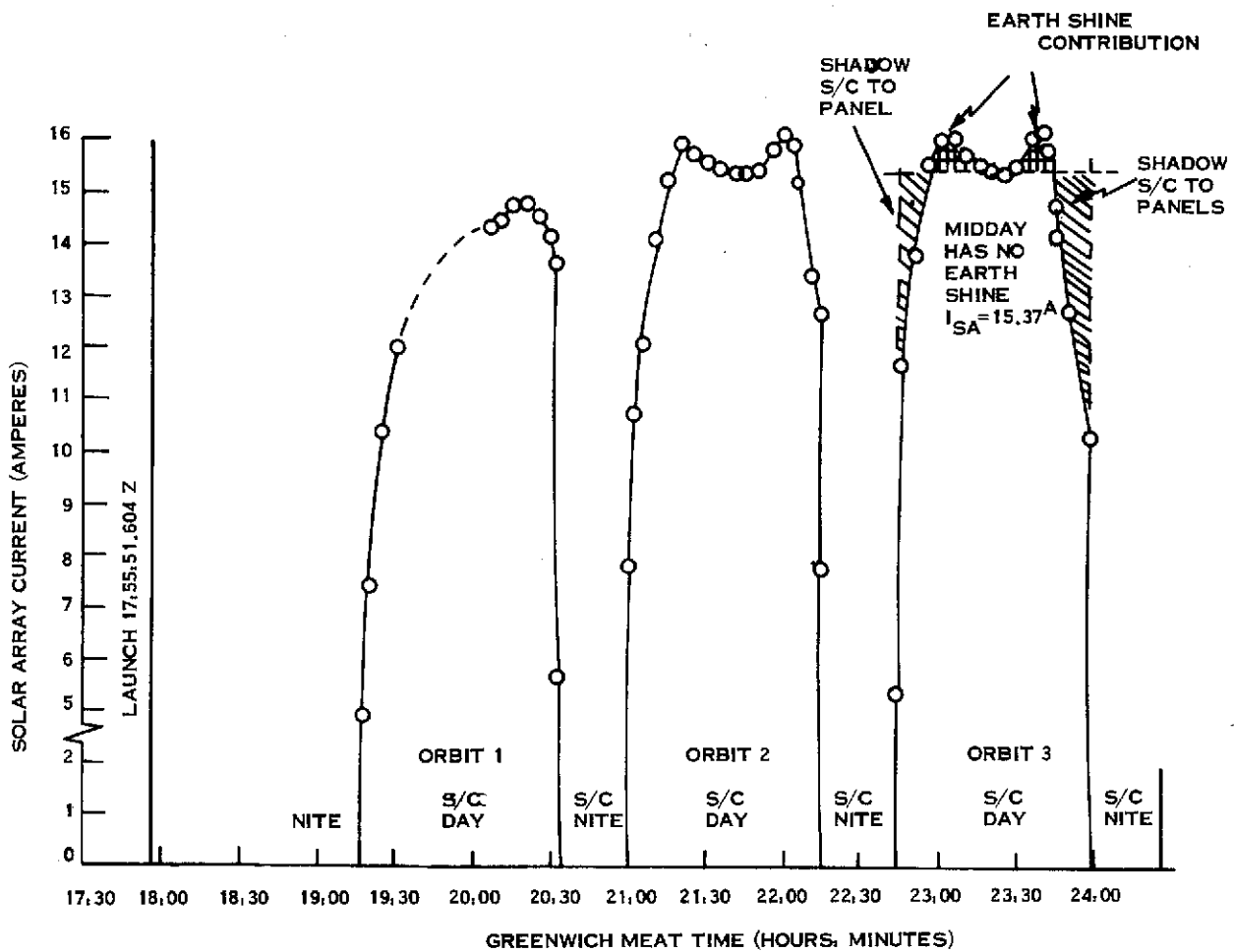


Figure 5-4. Initial Acquisition of Solar Array Current

During Orbit 7 the shunt limiter went into operation when battery taper began. The maximum unregulated bus voltage during shunt limiter operation was 37.4 volts which indicates that the solar array bus voltage was being held at approximately 38.0 volts since it is a diode drop away. This is within the voltage specification of  $38.0 \pm 0.150$  volts.

The auxiliary loads and compensation load command capability were verified in Orbit 2. In Orbit 2 compensation loads 1, 2, 3, 4, 5, 7 and 8 were turned on as scheduled to provide more even heating of the spacecraft until normal operation began. All compensation loads except 6 remained on thru Orbit 50.

Auxiliary loads were not required during Orbit 1, to allow a preplanned overcharge to be given to the batteries. In Orbit 2 auxiliary loads 1, 2, 3, 4 were turned on as scheduled by power management. Normal auxiliary load programming proceeded as planned by power management in subsequent orbits.

Table 5-3 shows major power subsystem parameters and Table 5-4 shows power subsystem telemetry for selected orbits. All regulated voltages are stable and in close agreement with ground measurements. Some parameters in Table 5-4 may be slightly different than Table 5-3 because 5-3 uses a time span for power management (night followed by a day) different from the time span which is used in Table 5-4 which is the playback period from the NBTR.

Table 5-3. LANDSAT-2 Major Power Subsystem Parameters

| Pwr. Mgmt. Orbit No.  | 2     | 7     | 26    | 50    |
|-----------------------|-------|-------|-------|-------|
| Batt 1 Max            | 32.05 | 33.85 | 33.51 | 33.43 |
| 2 Chge                | 31.95 | 33.91 | 33.40 | 33.40 |
| 3 Volt                | 31.98 | 34.03 | 33.43 | 33.35 |
| 4                     | 32.00 | 33.79 | 33.54 | 33.45 |
| 5                     | 31.96 | 33.68 | 33.42 | 33.42 |
| 6                     | 32.05 | 33.67 | 33.50 | 33.41 |
| 7                     | 31.99 | 33.79 | 33.54 | 33.45 |
| 8                     | 31.99 | 33.70 | 33.53 | 33.45 |
| Average               | 32.00 | 33.80 | 33.48 | 33.42 |
| Batt 1 End-of-Night   | 29.32 | 29.32 | 29.49 | 29.32 |
| 2 Volt                | 29.38 | 29.29 | 29.46 | 29.38 |
| 3                     | 29.32 | 29.32 | 29.49 | 29.32 |
| 4                     | 29.34 | 29.34 | 29.52 | 29.34 |
| 5                     | 29.40 | 29.40 | 29.48 | 29.40 |
| 6                     | 29.31 | 29.31 | 29.48 | 29.31 |
| 7                     | 29.34 | 29.42 | 29.51 | 29.34 |
| 8                     | 29.34 | 29.34 | 29.51 | 29.34 |
| Average               | 29.34 | 29.34 | 29.49 | 29.34 |
| Batt 1 Chge           | 12.07 | 12.26 | 12.50 | 12.76 |
| 2 Share               | 11.75 | 12.14 | 11.89 | 11.68 |
| 3 (%)                 | 12.60 | 12.81 | 12.41 | 12.24 |
| 4                     | 12.28 | 12.20 | 12.10 | 11.99 |
| 5                     | 13.02 | 12.89 | 12.84 | 12.84 |
| 6                     | 13.15 | 13.09 | 13.31 | 13.35 |
| 7                     | 12.69 | 12.77 | 12.85 | 12.90 |
| 8                     | 12.43 | 11.84 | 12.09 | 12.24 |
| Batt 1 Load           | 12.14 | 12.20 | 12.60 | 12.60 |
| 2 Share               | 12.62 | 12.81 | 12.69 | 12.70 |
| 3 (%)                 | 13.06 | 13.07 | 12.77 | 12.67 |
| 4                     | 12.64 | 12.50 | 12.47 | 12.44 |
| 5                     | 12.29 | 12.38 | 12.40 | 12.34 |
| 6                     | 12.49 | 12.80 | 12.81 | 12.70 |
| 7                     | 12.40 | 12.48 | 12.39 | 12.47 |
| 8                     | 12.35 | 11.75 | 11.98 | 12.04 |
| Batt 1 Temp           | 17.39 | 18.68 | 19.86 | 21.46 |
| 2 in                  | 17.60 | 18.83 | 19.53 | 20.25 |
| 3 (°C)                | 16.51 | 17.20 | 17.97 | 18.60 |
| 4                     | 18.08 | 20.04 | 20.73 | 20.83 |
| 5                     | 21.80 | 22.94 | 24.33 | 24.98 |
| 6                     | 20.80 | 21.92 | 23.23 | 24.26 |
| 7                     | 20.69 | 22.14 | 23.54 | 24.71 |
| 8                     | 19.78 | 21.09 | 22.21 | 23.63 |
| Average               | 19.07 | 20.36 | 21.43 | 22.34 |
| S/C Reg Bus Pwr. (W)  |       |       |       |       |
| Comp Load Pwr. (W)    |       |       |       |       |
| (P/O S/C Reg Bus Pwr) |       |       |       |       |
| P/L Reg Bus Pwr. (W)  |       |       |       |       |
| C/D Ratio             | 1.09  | 1.21  | 1.13  | 1.15  |
| Total Charge (A-M)    | 197.4 | 280.6 | 256.3 | 271.9 |
| Total Discharge (A-M) | 181.5 | 232.6 | 228.0 | 237.2 |
| Solar Array (A-M)     | 1106  | 1096  | 1110  | 1106  |
| S. A. Peak I (Amp)    | 16.15 | 16.05 | 16.25 | 16.05 |
| Sun Angle (Deg)       |       |       |       |       |
| Max R Pad Temp (°C)   |       |       |       |       |
| Min R Pad Temp (°C)   |       |       |       |       |
| Max L Pad Temp (°C)   |       |       |       |       |
| Min L Pad Temp (°C)   |       |       |       |       |

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Table 5-4. LANDSAT 2 Power Subsystem Analog Telemetry  
(Average Value for Data Received in NBTR Playback)

| Function | Description   | Unit | T/V* | Orbits |       |
|----------|---------------|------|------|--------|-------|
|          |               |      |      | 3      | 50    |
| 6001     | Batt 1 Disc I | Amp  | **   | 0.87   | 1.01  |
| 6002     | 2             |      | **   | 0.88   | 1.01  |
| 6003     | 3             |      | **   | 0.89   | 1.00  |
| 6004     | 4             |      | **   | 0.86   | 1.00  |
| 6005     | 5             |      | **   | 0.88   | 0.99  |
| 6006     | 6             |      | **   | 0.93   | 1.02  |
| 6007     | 7             |      | **   | 0.88   | 1.00  |
| 6008     | 8             |      | **   | 0.86   | 0.97  |
| 6011     | Batt 1 Chg I  | Amp  | **   | 0.34   | 0.47  |
| 6012     | 2             |      | **   | 0.33   | 0.43  |
| 6013     | 3             |      | **   | 0.36   | 0.45  |
| 6014     | 4             |      | **   | 0.35   | 0.44  |
| 6015     | 5             |      | **   | 0.37   | 0.47  |
| 6016     | 6             |      | **   | 0.37   | 0.49  |
| 6017     | 7             |      | **   | 0.36   | 0.47  |
| 6018     | 8             |      | **   | 0.36   | 0.45  |
| 6021     | Batt 1 Volt   | VDC  | **   | 30.69  | 31.50 |
| 6022     | 2             |      | **   | 30.67  | 31.48 |
| 6023     | 3             |      | **   | 30.68  | 31.49 |
| 6024     | 4             |      | **   | 30.68  | 31.49 |
| 6025     | 5             |      | **   | 30.69  | 31.50 |
| 6026     | 6             |      | **   | 30.69  | 31.49 |
| 6027     | 7             |      | **   | 30.71  | 31.52 |
| 6028     | 8             |      | **   | 30.68  | 31.49 |
| 6031     | Batt 1 Temp   | DGC  | **   | 17.41  | 21.59 |
| 6032     | 2             |      | **   | 17.53  | 20.53 |
| 6033     | 3             |      | **   | 16.28  | 18.80 |
| 6034     | 4             |      | **   | 18.17  | 20.90 |

Table 5-4. LANDSAT 2 Power Subsystem Analog Telemetry (Cont'd)  
(Average Value for Data Received in NBTR Playback)

| Function  | Description  | Unit | Orbits |       |       |
|-----------|--------------|------|--------|-------|-------|
|           |              |      | T/V*   | 3     | 50    |
| 6035      | 5            |      | **     | 21.85 | 25.16 |
| 6036      | 6            |      | **     | 20.74 | 24.37 |
| 6037      | 7            |      | **     | 20.50 | 24.83 |
| 6038      | 8            |      | **     | 19.79 | 23.75 |
| 6040      | Rt. Pad Temp | DGC  | **     | 29.59 | 28.96 |
| 6041      | Rt Pad VM    | VDC  | **     | 32.82 | 33.72 |
| 6042      | Rt. Pad VN   | VDC  | **     | 32.52 | 33.46 |
| 6044      | Lt. Pad Temp | DGC  | **     | 26.51 | 25.56 |
| 6045      | Lt. Pad VF   | VDC  | **     | 33.45 | 34.40 |
| 6046      | Lt. Pad VG   | VDC  | **     | 33.54 | 34.48 |
| 6050      | S/C UR Bus V | VDC  | **     | 30.86 | 31.73 |
| 6051      | S/C RG Bus V | VDC  | 24.56  | 24.54 | 24.57 |
| 6052      | Aux Reg AV   | VDC  | 23.36  | 23.35 | 23.36 |
| 6053      | Aux Reg BV   | VDC  | 23.35  | 23.35 | 23.37 |
| 6054      | Solar I      | Amp  | **     | 14.95 | 14.81 |
| 6055      | S/C RG Bus I | Amp  | **     | 6.83  | ***   |
| 6056      | S/C RG Bus I | Amp  | **     | 6.84  | 7.23  |
| 6058      | PC Mod T1    | DGC  | **     | 18.70 | 21.67 |
| 6059      | PC Mod T2    | DGC  | **     | 17.80 | 20.44 |
| 6070      | P/L RG Bus V | VDC  | 24.60  | 24.57 | 24.61 |
| 6071      | P/L UR Bus V | VDC  | **     | 30.90 | 31.85 |
| 6072      | P/L RG Bus I | Amp  | **     | 0.41  | ***   |
| 6073      | P Aux AV     | VDC  | 23.51  | 23.46 | 23.47 |
| 6074      | P Aux BV     | VDC  | 23.48  | 23.43 | 23.46 |
| 6075      | PR Mod T1    | DGC  | **     | 18.60 | 20.84 |
| 6076      | PR Mod T2    | DGC  | **     | 20.28 | 22.13 |
| 6079      | Fuse Blow V  | VDC  | **     | 24.45 | 24.48 |
| 6080      | Shunt 1 I    | Amp  | **     | 0.0   | 0.0   |
| 6081      | 2            |      | **     | 0.0   | 0.0   |
| 6082      | 3            |      | **     | 0.0   | 0.0   |
| 6083      | 4            |      | **     | 0.0   | 0.0   |
| 6084      | 5            |      | **     | 0.0   | 0.0   |
| 6085      | 6            |      | **     | 0.0   | 0.0   |
| 6086      | 7            |      | **     | 0.0   | 0.0   |
| 6087      | 8            |      | **     | 0.0   | 0.0   |
| 6100      | P/L RG Bus I | Amp  | **     | 0.41  | 0.38  |
| Total No. | Major Frames | Frm  | **     | 369   | 396   |

\*T/V (20°C)

\*\*Data from T/V not applicable

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SECTION 6

ATTITUDE CONTROL SUBSYSTEM

## SECTION 6

### ATTITUDE CONTROL SUBSYSTEM

The Attitude Control Subsystem (ACS) consists of 13 major component parts, plus a thermal subsystem mounted to a structure composed of mounting surfaces above a honeycomb base-plate. Solar paddles are attached to two separate shafts, with individual drive motors to provide greater reliability in solar tracking.

The major requirement of the ACS is to provide satellite alignment with the local earth vertical and orbit velocity to within  $\pm 0.7$  degree in pitch and roll and  $\pm 1$  degree in yaw. The instantaneous angular rates about the axes during normal operation are required to be less than .10 degree/second.

To accomplish this, a 3-axis active ACS is provided, using horizon scanners for roll and pitch attitude error sensing, and a rate gyro used in a gyro-compassing mode to sense yaw attitude. Included also is a yaw rate gyro to sense yaw rate in an acquisition mode. The torquing subsystem uses a combination of reaction jets to provide net momentum control and large control torques when required. Flywheels are utilized for fine control and residual momentum storage. See Figure 6-1 for the ACS functional block diagram, and Figure 6-2 for the hardware configuration.

The ACS subsystem was launched in the mode shown in Table 6-1.

LANDSAT-2 was launched from the Western Test Range on 22 January 1975 at 17:55:51 hours GMT.

During the orbit insertion - preseparation phase of the launch activity - ACS telemetry received after shroud ejection indicated a normal ride with all ACS systems functioning properly.

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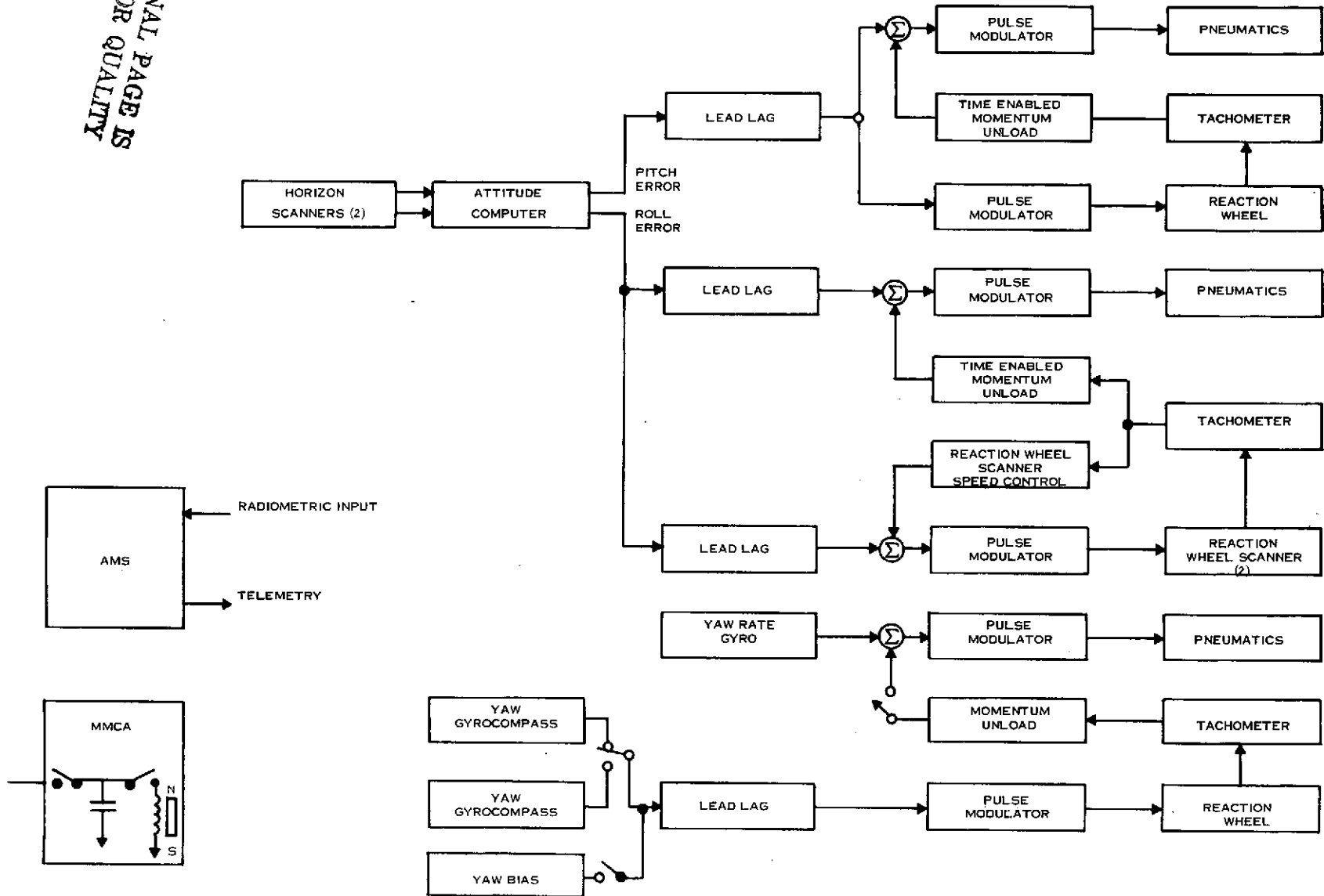


Figure 6-1. Attitude Control Subsystem Block Diagram

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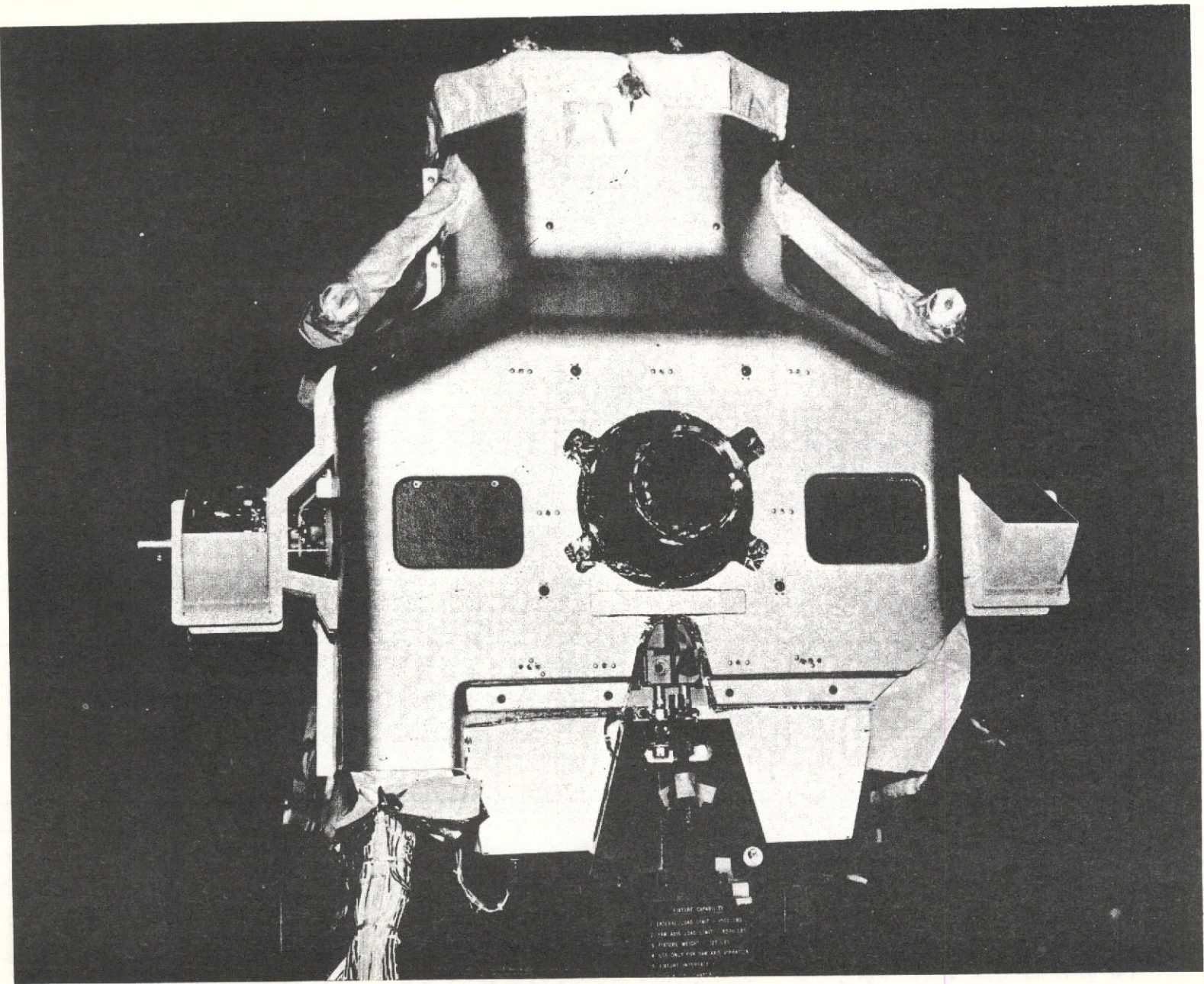


Figure 6-2. Attitude Control Subsystem

Table 6-1. Attitude Control Subsystem Launch Mode

| ACS Subsystem |       | Cmd | Verification (Event No.)            |
|---------------|-------|-----|-------------------------------------|
| LO VOLT INT   | RESET | 044 | Pneumatics Enable (164)             |
| RSAD RATE     | NORM  | 425 | SAD Right Rate - Normal (178)       |
| LSAD RATE     | NORM  | 244 | SAD Left Rate - Normal (176)        |
| RSAD RATE     | EN    | 311 | Right SAD CCW Reset, CW (177)       |
| LSAD RATE     | EN    | 365 | Left SAD RESET CW, CCW (175)        |
| RSAD PWR      | FUSE  | 674 | SAD Right Power - FUSD (191)        |
| LSAD PWR      | FUSE  | 713 | SAD Left Power FUSD (190)           |
| PNEU          | EN    | 040 | Pneumatics - Enable (164)           |
| PNEU INTLK    | DIS   | 042 | Pneumatics Interlock - Bypass (165) |
| PMB MODE      | DIS   | 104 | None                                |
| P POS BIAS    | +     | 145 | Pitch Bias - Position (185)         |
| 0.6 PPB       | DIS   | 663 | Pitch Bias -4.87, (1048)            |
| 2.0 PPB       | DIS   | 661 | 4.87 TMV (1048)                     |
| 2.9 PPB       | DIS   | 122 | 4.87 TMV (1048)                     |
| P UNLOAD      | EN    | 165 | Pitch - Roll Unload, Both (169)     |
| R UNLOAD      | EN    | 161 | Pitch - Roll Unload, Both (169)     |
| TACH          | EN    | 064 | R DFT ST - Normal (188)             |
| TACH GAIN     | NORM  | 100 | R DFT ST - Normal (188)             |
| YAW WHEEL     | EN    | 163 | Yaw Wheel Enable (180)              |
| YAW POS BIAS  | +     | 160 | Yaw Bias 6.35 RMV (1049)            |
| 0.1 YPB       | DIS   | 120 | Yaw Bias 6.35 TMV (1049)            |
| 0.3 YPB       | DIS   | 060 | Yaw Bias 6.35 TMV (1049)            |
| 0.6 YPB       | DIS   | 623 | Yaw Bias 6.35 TMV (1049)            |
| RLNA/YAW      | DIS   | 102 | RLNA - Yaw - Disable (179)          |
| YAW MODE      | ACQ   | 204 | Yaw Mode - Acquisition (162)        |
| 0. A Mode     | DIS   | 221 | Orbit Adj - Disable (163)           |
| 400 RPM INT   | EN    | 203 | 400 RPM - Enable (189)              |
| RMP B         | EN    | 223 | Select RMP - No. 2 (170)            |
| RMP B HTR     | ON    | 305 | RP2 Stat Normal (173)               |
| RMP B MTR     | ON    | 304 | RP2 Stat Normal (173)               |
| RMP A MTR     | ON    |     |                                     |
| AND HTR       | ON    | 307 | RMP A OFF                           |
|               |       | 271 | RMP A MOTOR START                   |
|               |       | 307 | RMP A OFF                           |
|               |       | 326 | RMP A ON                            |
|               |       | 271 | RMP A MOTOR START                   |
|               |       |     | 8 SEC DELAY                         |
|               |       | 326 | RMP A ON                            |
|               |       |     | 30 SEC DELAY                        |
|               |       | 370 | RMP A HTR ON                        |
| EN SCAN SEL   | A     | 636 | Scanners Both 1 (194)               |
| SSM           | LOCK  | 675 | Scanner - Lock (192)                |

The Delta vehicle began its pitch-up maneuver at 18:47:30 hours GMT. Qualitative attitude error telemetry information - roll coarse error, pitch coarse error and yaw gyro rate - received from LANDSAT-2 prior to rear scanner uncovering indicate that by pitch-up completion (18:54:00), the spacecraft was well aligned with its normal attitude coordinates (see Figure 6-3).

LANDSAT-2 separated from the Delta vehicle at 22:18:54:55. Two and one half seconds later, the paddle unfold timer functioned on schedule and the solar paddles deployed completely.

Seventeen and one half seconds after separation (18:55:12) the ACS was activated, and acquisition in roll, pitch, and yaw was accomplished in a classical, textbook fashion with a minimal amount of ACS gas used.

Fifty two and one-half seconds after separation the SADS were activated and both drove at normal bias rate during spacecraft night.

As the spacecraft entered daylight at 19:17:03, both SADS performed normally. The RSAD began to slew and acquire because its sun sensor was exposed; while the LSAD lagged behind until 19:44:30, when its sun sensor cleared the albedo shield. It began to slew and by 20:26:30, both SADS were in synch and aligned properly with the sun.

Solar current was demonstrated prominently by 19:20:00.

LANDSAT-2's first ascending node crossing occurred at 18:57:12, and by 18:59:00 the ACS was operating normally.

The spacecraft was commanded into the YAW NORMAL mode at 19:10:47, and ACS PNEUMATICS were disabled at 19:11:46.

RMPA lower motor voltage was commanded at 19:34:50.

Day to night transition occurred at 20:31:52; the second ascending node crossing followed at 20:40:38 and finally, RMP A was commanded OFF at 21:14:06, during Orbit 2 Alaska.

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1

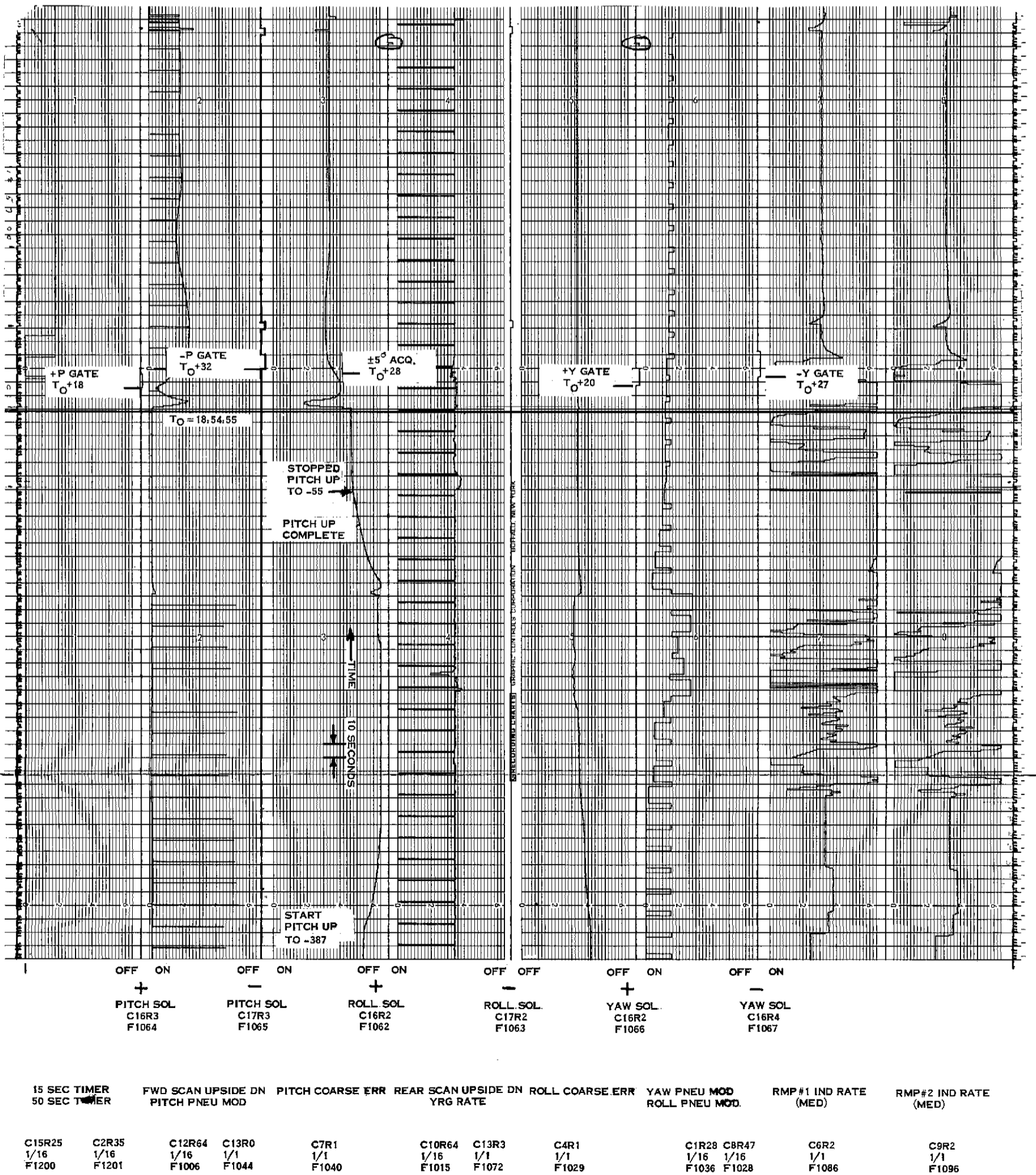
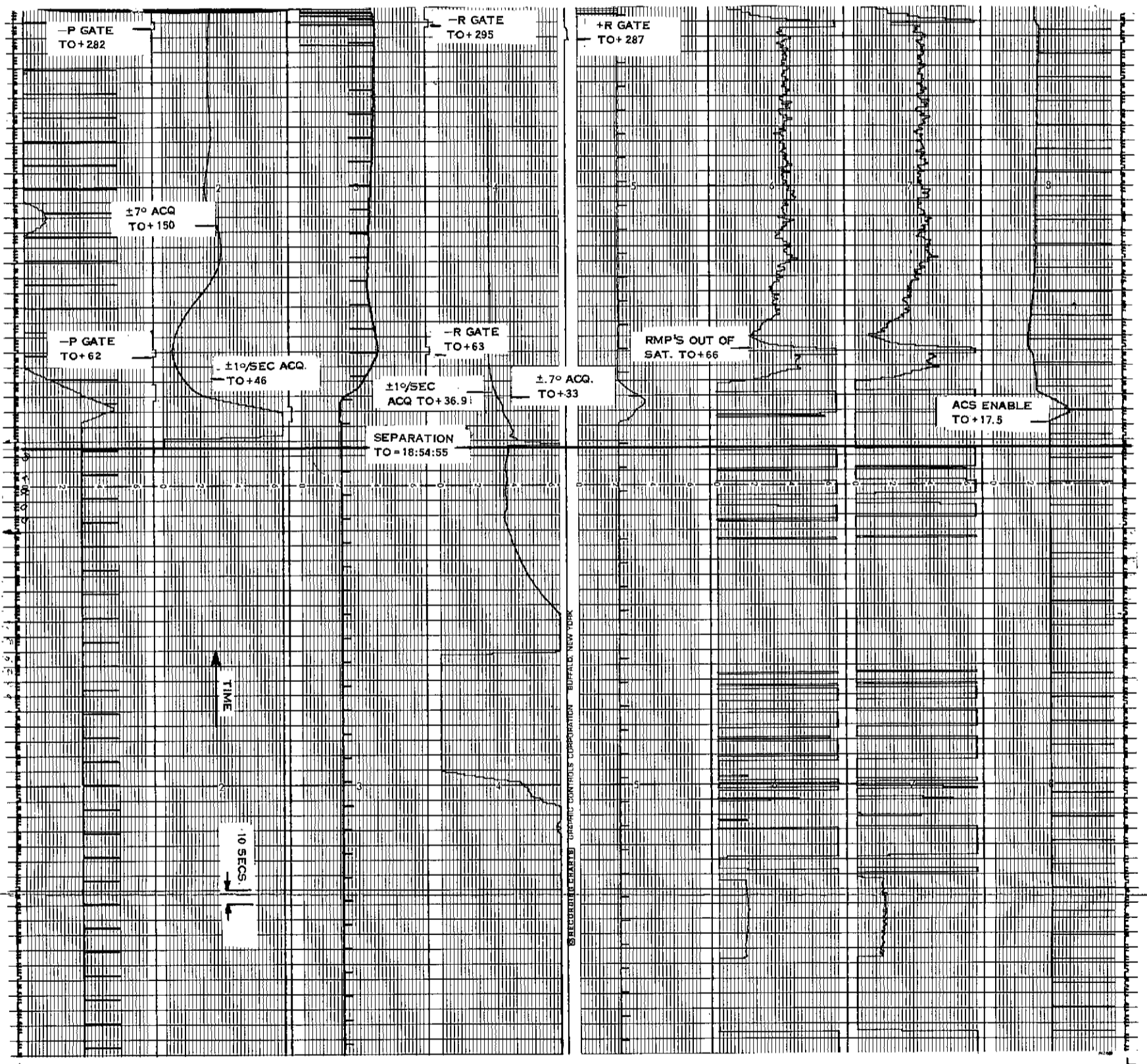


Figure 6-3A, Separation - Acquisition Telemetry

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2

FOLDOUT FRAME



|     |           |     |           |     |          |     |          |          |       |           |       |       |       |
|-----|-----------|-----|-----------|-----|----------|-----|----------|----------|-------|-----------|-------|-------|-------|
| OFF | ON        | OFF | ON        | OFF | ON       | OFF | ON       | DIS      | ENA   | DIS       | ENA   | 1     | 2     |
| -   | PITCH SOL | +   | PITCH SOL | -   | ROLL SOL | +   | ROLL SOL | FWD SCAN | (1)   | REAR SCAN | (1)   | SCANR | DIS   |
|     | C17R3     |     | C16R3     |     | C17R2    |     | C16R2    | C1R2     | F1008 | C18R1     | F1017 | C15R1 | F1291 |
|     | F1065     |     | F1064     |     | F1063    |     | F1062    |          |       |           |       |       |       |

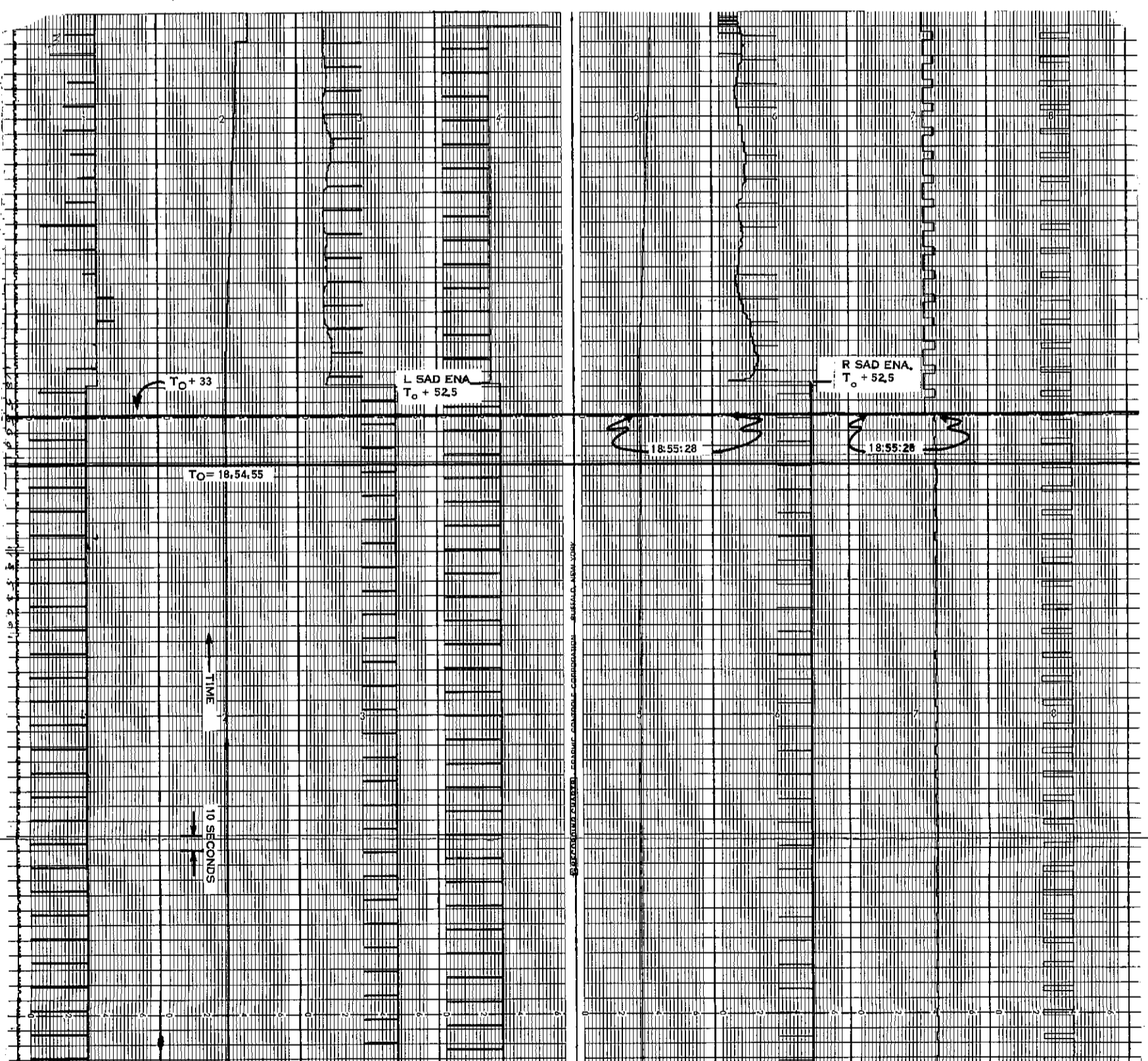
|                                  |                        |                                  |                      |                                   |                          |                          |                                   |
|----------------------------------|------------------------|----------------------------------|----------------------|-----------------------------------|--------------------------|--------------------------|-----------------------------------|
| PITCH FW SPEED<br>ROLL DIFF TACH | PITCH FINE ERROR       | ROLL FWD FW SPEED<br>ACS CLOCK A | ROLL FINE ERROR      | ROLL REAR FW SPEED<br>ACS CLOCK B | RMP NO. 1 IND<br>RATE HI | RMP NO. 2 IND<br>RATE HI | YAW TACH OUTPUT<br>P/Y RMP STATUS |
| C5R2<br>F1043<br>1/1             | C8R64<br>F1031<br>1/16 | C4R2<br>F1041<br>1/1             | C5R0<br>F1026<br>1/1 | C18R72<br>F1053<br>1/16           | C5R1<br>F1030<br>1/1     | C7R0<br>F1027<br>1/1     | C1R8<br>F1054<br>1/16             |
|                                  |                        |                                  |                      |                                   | C9R1<br>F1087<br>1/1     |                          | C7R2<br>F1097<br>1/1              |
|                                  |                        |                                  |                      |                                   |                          |                          | C6R1<br>F1035<br>1/1              |
|                                  |                        |                                  |                      |                                   |                          |                          | C12R35<br>F1049<br>1/16           |

Figure 6-3B. Separation - Acquisition Telemetry

FOLDOUT FRAME 6-9/10



FOR PRINT FRAME



|                                       |                      |                                      |                             |                                     |                                      |                                   |                               |                                      |                      |  |                         |                                    |                         |
|---------------------------------------|----------------------|--------------------------------------|-----------------------------|-------------------------------------|--------------------------------------|-----------------------------------|-------------------------------|--------------------------------------|----------------------|--|-------------------------|------------------------------------|-------------------------|
| ENA<br>400 RPM INLK<br>C12R1<br>F1061 | DIS<br>C2R2<br>F1250 | CCW<br>SAD L<br>C2R2<br>F1250        | CW<br>φ SW                  | HIGH<br>SAD L RATE<br>C1R2<br>F1249 | NORM                                 | CCW<br>SAD R<br>C18R1<br>F1230    | CW<br>φ SW                    | HIGH<br>SAD R RATE<br>C15R1<br>F1229 | NORM                 | LOCK<br>SINGLE SCAN MODE<br>C10R1<br>F1290 | UNLOCK                  | TOC<br>CMD CLOCK<br>C17R3<br>F8057 | TIC                     |
| PITCH TACH<br>SAD LEFT TACH           | LEFT COSINE POT      | SAD L SUN SENSOR<br>SAD L MTR WIND V | SAD R TACH<br>SOLAR ARRAY I | RIGHT COSINE POT                    | SAD R SUN SENSOR<br>SAD R MTR WIND V | RMP #1 MTR CURR<br>MANIFOLD PRESS | RMP #2 MTR CURR<br>TANK PRESS |                                      |                      |  |                         |                                    |                         |
| C1R64<br>1/16<br>F1042                | C7R3<br>1/1<br>F1241 | C8R39<br>1/16<br>F1293               | C18R34<br>1/16<br>F1246     | C6R3<br>1/1<br>F1240                | C5R3<br>1/1<br>F1221                 | C1R9<br>1/16<br>F6054             | C2R39<br>1/16<br>F1292        | C8R44<br>1/16<br>F1226               | C9R0<br>1/1<br>F1220 | C15R44<br>1/16<br>F1082                    | C18R71<br>1/16<br>F1213 | C12R44<br>1/16<br>F1092            | C15R62<br>1/16<br>F1212 |

Figure 6-3C. Separation - Acquisition Telemetry

WIDDOUT FRAME

6-11/12

## ACS SYSTEMS ACQUISITION TELEMETRY EVALUATION

The ACS system functioned flawlessly during the attitude acquisition phase of launch operations and demonstrated its ability to rapidly acquire and maintain spacecraft normal attitude with a minimum number of corrective maneuvers.

Acquisition in pitch, roll, and yaw was deemed successfully accomplished when the spacecraft's normal attitude was oriented and maintained within the following dynamic constraints:

### PITCH & ROLL

- Angular position error within the  $\pm 5^{\circ}$  control deadband
- The flywheels have captured, and control of the spacecraft is maintained via flywheel operation rather than pneumatics
- The flywheel speeds are below saturation levels
- The angular position error within the  $\pm .7^{\circ}$  control deadband, can be maintained via flywheel activity
- The angular position rates of change are equal to or below  $.1^{\circ}/\text{SEC}$

### YAW

- The spacecraft has acquired in PITCH AND ROLL within the  $\pm 5^{\circ}$  deadband
- The YAW gyro is running below saturation
- The RMP HI mode is out of saturation
- The YAW rate is equal to or below  $.25^{\circ}/\text{SEC}$

LANDSAT-2's separation and attitude acquisition times were determined by evaluating the telemetry strip charts (Figure 6-3) generated during this phase of launch operations and then confirming the activation times of principle ACS subsystems vis the DLP program.

Chronology consistent with the criteria defining spacecraft attitude acquisition is summarized in Table 6-2.

Table 6-2. LANDSAT 2 - Attitude Acquisition Chronology

| Acquisition Criteria              | Roll                              | Pitch                          | Yaw                           |
|-----------------------------------|-----------------------------------|--------------------------------|-------------------------------|
| $\pm 5^\circ$ deadband control    | $T_0$<br>(18:54:55)               | $T_0 + 28$ secs<br>(18:55:23)  | -                             |
| $\pm .7^\circ$ deadband control   | $T_0 + 33$ secs<br>(18:55:28)     | $T_0 + 150$ secs<br>(18:57:25) | -                             |
| $\pm .1^\circ$ /sec error rate    | $T_0 + 36.9$ secs<br>(18:55:31.9) | $T_0 + 46$ secs<br>(18:55:41)  | -                             |
| RMP's (HI mode) out of saturation | -                                 | -                              | $T_0 + 66$ secs<br>(18:56:01) |
| Yaw rate $\leq .25^\circ$ /sec    | -                                 | -                              | $T_0 + 66$ secs<br>(18:56:01) |
| Full Acquisition                  | 36.9 sec                          | 150 secs                       | 150                           |

( $T_0$  = time of separation)

#### PITCH AND ROLL ERROR RATE DETERMINATION

Pitch and roll error rates are not telemetered functions; consequently, in order to determine the instants in time when the spacecraft had acquired in pitch and roll with an angular rate of change less than  $\pm .1^\circ$ /sec, it was necessary to employ a technique that utilized pitch and roll angular error telemetry, recorded as a differentiable function of time.

Function 1041 (Pitch Fine Error) and Function 1030 (Roll Fine Error) were replotted in engineering units (degrees) as a function of time from points taken directly from the strip charts.

The resulting pitch error and roll error curves were then graphically differentiated, using a modified mean value theorem approach. This technique provided the slope of a point on the error curve as a function of time.

The slopes were plotted against the same time scale as the error curves, with each slope data point (ordinate) in synch with its corresponding point on the error curve.

The resulting "rate" curves, Figures 6-4 and 6-5, then defined the times when acquisition occurred according to "rate" criteria.

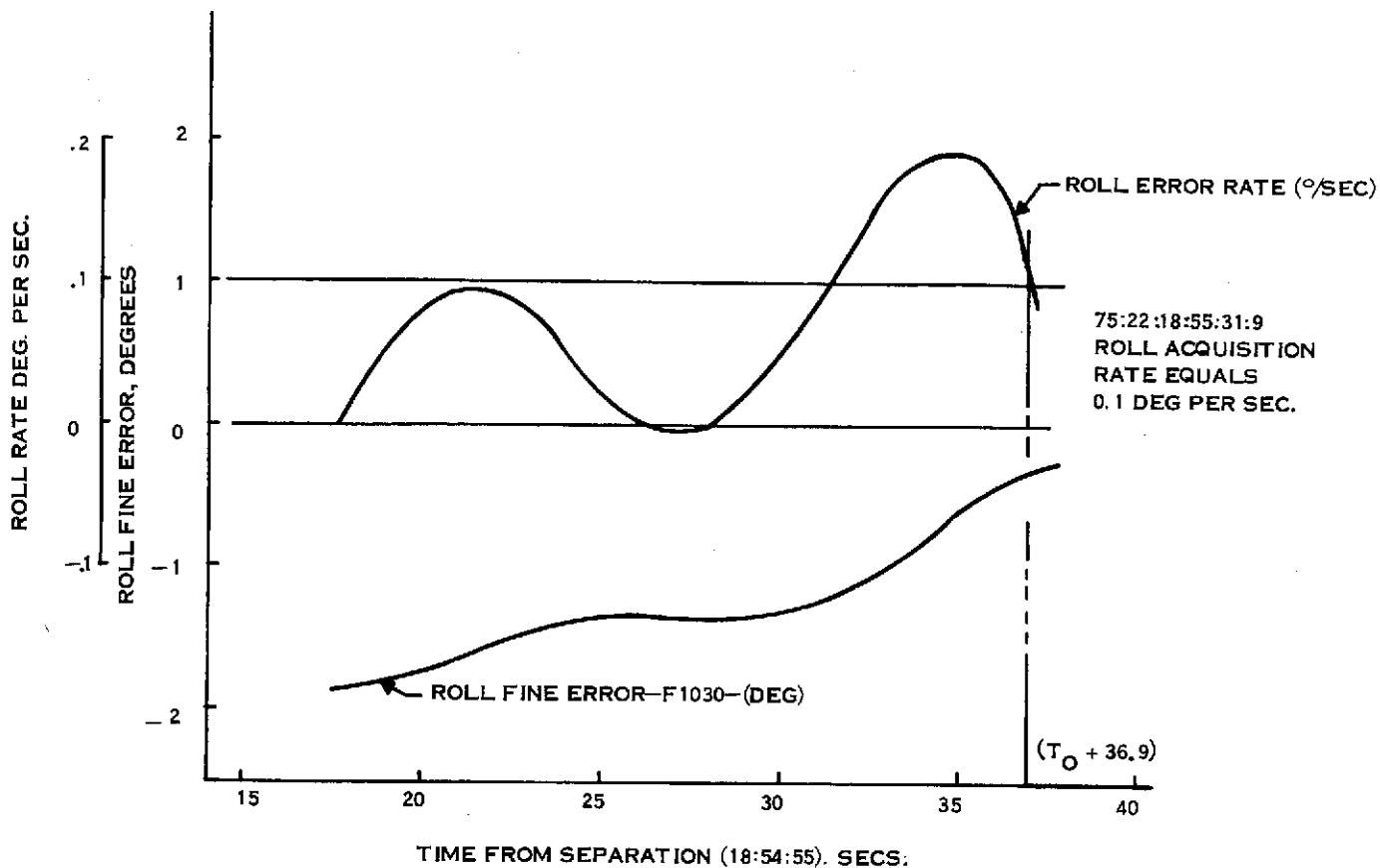


Figure 6-4. LANDSAT-2 Roll Rate Acquisition

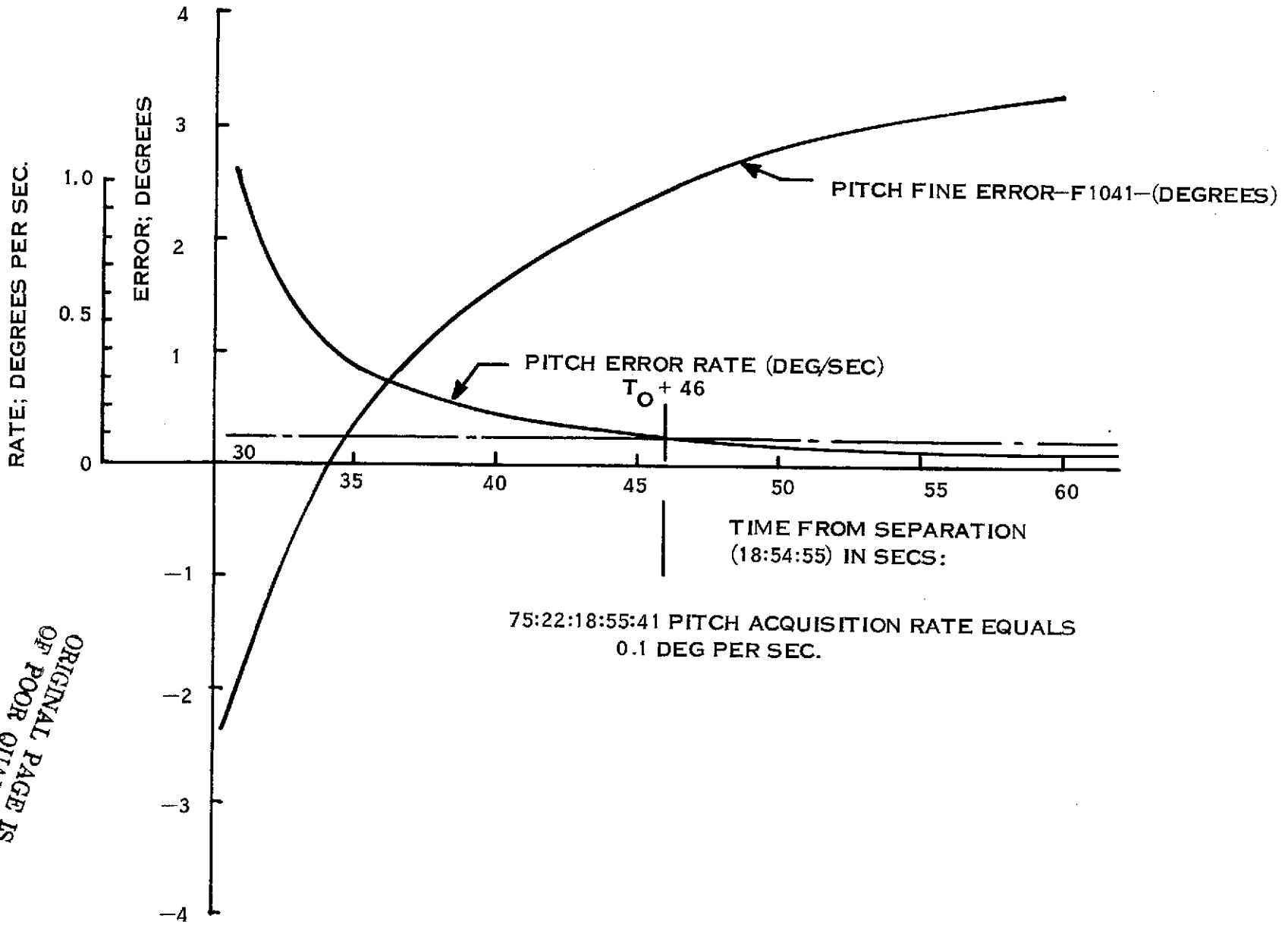


Figure 6-5. LANDSAT-2 Pitch Rate Acquisition

## ROLL ACQUISITION EVALUATION

Roll acquisition was accomplished with facility shortly after separation. The Delta vehicle assisted in this operation by pre-positioning LANDSAT-2 almost within the  $\pm 5^{\circ}$  control deadband, even before separation.

Figure 6-3, Roll Coarse Error, shows the roll attitude error beginning to decrease with the commencement of the pitch-up maneuver ( $T_0 - 425$ ). Roll Fine Error shows the spacecraft being oriented to near roll acquisition attitude at the completion of the pitch-up maneuver ( $T_0 - 55$ ).

Separation ( $T_0 = 18:54:55$  GMT) generated roll attitude perturbations, but these motions damped out rapidly and at ACS systems enable ( $T_0 + 17.5$ ) the spacecraft was within the  $\pm 5^{\circ}$  control deadband.

Roll error continued to decrease after ACS activation and entered the  $\pm .7^{\circ}$  control deadband at ( $T_0 + 33$ ) seconds.

Roll forward flywheel speed began to increase, and one - roll gate at ( $T_0 + 63$ ) was required to assist the flywheels in controlling roll attitude within the  $\pm .7^{\circ}$  deadband.

Figure 6-4 shows the spacecraft's roll rates from activation through  $0.1^{\circ}/\text{SEC}$  roll rate acquisition. The curve was not extended in time beyond the  $0.1^{\circ}/\text{SEC}$  roll rate acquisition point because roll fine error was approaching zero in an asymptotic manner with no rapid changes in slope indicated. Table 6-3 summarizes LANDSAT 2's Roll Acquisition Chronology.

Table 6-3. Roll Acquisition Telemetry Data

| Activity   | Time                               | 1029<br>Roll<br>Coarse<br>Error(Deg) | 1030<br>Roll<br>Fine<br>Error(Deg) | *<br>Roll<br>Rate(Deg/Sec) | 1026<br>Roll<br>Fwd<br>(RPM) | 1027<br>Roll<br>Rear<br>(RPM) |
|--|------------------------------------|--------------------------------------|------------------------------------|----------------------------|------------------------------|-------------------------------|
| Separation   | T <sub>0</sub><br>18:54:55         | -5.5 <sup>0</sup>                    | SAT                                | -                          | 615                          | 615                           |
| Separation + 10 Sec  | T <sub>0</sub> +10<br>18:55:05     |                                      | -2.15 <sup>0</sup>                 | -                          | 615                          | 615                           |
| ACS Loop Enable  | T <sub>0</sub> +17.5<br>18:55:12.5 |                                      | -1.85                              | 0                          | 615                          | 615                           |
| + .7 <sup>0</sup> Fine Error Dead<br>Band Acquisition        | T <sub>0</sub> +33<br>18:55:28     |                                      | - .70 <sup>0</sup>                 | + .19 <sup>0</sup> /Sec    | 625                          | 923                           |
| + .1 <sup>0</sup> /Sec Roll Rate<br>Dead Band<br>Acquisition | T <sub>0</sub> +36.9<br>18:55:31:9 |                                      | - .32 <sup>0</sup>                 | + .1 <sup>0</sup> /Sec     | 908                          | 818                           |
| (1063)<br>-Roll Sol  | T <sub>0</sub> +63<br>18:55:58     |                                      | + .36 <sup>0</sup>                 |                            | 1093                         | 615                           |
| (1062)<br>+Roll Sol  | T <sub>0</sub> +287<br>18:59:31    |                                      | + .36 <sup>0</sup>                 |                            | 1064                         | 615                           |
| (1063)<br>-Roll Sol  | T <sub>0</sub> +295<br>18:59:39    |                                      | + .36 <sup>0</sup>                 |                            | 1064                         | 615                           |

\*Calculated - See Figure 6-4

### PITCH ACQUISITION EVALUATION

The Pitch Coarse Error and Pitch Fine Error telemetry channels shown in Figure 6-3 presents the chronology of LANDSAT-2's pitch acquisition.

A smooth and accurate pitch-up maneuver terminated with the spacecraft in an approximate -18.5<sup>0</sup> pitch attitude. This value is qualitative because the spacecraft's rear scanner was covered by the solar paddles during the pitch-up/separation operation.

A +pitch gate occurred almost immediately after ACS loop activation at (T<sub>0</sub> +17.5). The resulting impulsive torque was adequate to orient the spacecraft within the ±5<sup>0</sup> control deadband at (T<sub>0</sub> +28).

A -pitch gate at (T<sub>0</sub> +32) was necessary to reduce the pitch error further and to dampen the spacecraft's pitch rate.

Pitch rate acquisition occurred at (T<sub>0</sub> +46) as shown in Figure 6-5.

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A final -pitch gate occurred at ( $T_0 + 62$ ) and this action reduced the pitch error to within the  $\pm 0.7^\circ$  deadband by ( $T_0 + 150$ ).

Pitch flywheel activity was smooth and responsive during the entire pitch acquisition phase, and its performance since acquisition has been normal. Its wheel speeds ranged from -185 rpm to +1170 rpm. Table 6-4 summarizes LANDSAT 2's pitch acquisition chronology.

Table 6-4. Pitch Acquisition Telemetry Data

| Activity  | Time                   | 1040<br>Pitch<br>Coarse<br>Error<br>(Deg) | 1041<br>Pitch<br>Fine<br>Error<br>(Deg) | *<br>Pitch<br>Error<br>Rate<br>(Deg/Sec) | 1043<br>Pitch<br>Flywheel<br>Speed<br>(RPM) |
|---|------------------------|---|---|--|---|
| Separation  | To<br>18:54:55         | -18.5                                     | -                                       | -  | -10.0<br>CCW                                |
| Separation + 10                                     | To +10<br>18:55:05     | -4.6                                      | -                                       | -  | -10.0<br>CW                                 |
| ACS Loop Enable                                     | To +17.5<br>18:55:12.5 | -11.25                                    | -                                       | -  | -10.0<br>CCW                                |
| + Pitch Gate (1064)                                 | To +18<br>18:55:13     | -11.25                                    | -                                       | -  | -10.0<br>CCW                                |
| $\pm 5^\circ$ Pitch Error<br>Acquisition            | To +28<br>18:55:23     | -5.                                       | -                                       | -  | -180.0<br>CCW                               |
| - Pitch Gate (1065)                                 | To +32<br>18:55:27     | -   | -1.09                                   | $+ .71^\circ/\text{Sec}$                 | -95<br>CW                                   |
| $\pm .1^\circ/\text{Sec}$ Error<br>Rate Acquisition | To +46<br>18:55:41     | -   | 2.45                                    | $+ .1^\circ/\text{Sec}$                  | 183<br>CW                                   |
| - Pitch Gate (1065)                                 | To +62<br>18:55:57     | -   | 3.45                                    | -  | -660<br>CCW                                 |
| $\pm .7^\circ$ Fine Error<br>Acquisition            | To +150<br>18:57:25    | -   | -.7                                     | -  | 260<br>CW                                   |
| - Pitch Gate (1065)                                 | To +282<br>18:59:37    | -   | -.1                                     | -  | 730<br>CW                                   |

\*Calculated-See Figure 6-5



## YAW ACQUISITION EVALUATION

The yaw rate gyro remained essentially constant at  $-0.0313^{\circ}/\text{sec}$  during the acquisition phase of the launch activity as can be seen in Figure 6-3.

Exceptions occurred during the following intervals:

| <u>Activity</u>       | <u>Time</u> | <u>Yaw Rate Error</u>       |
|-----------------------|-------------|-----------------------------|
| ● pitch-up maneuver   | $T_0 -198$  | $+1.453^{\circ}/\text{sec}$ |
| ● pitch-up conclusion | $T_0 -55$   | $-.4009^{\circ}/\text{sec}$ |
| ● + yaw gate          | $T_0 +20$   | $+.1754^{\circ}/\text{sec}$ |
| ● - yaw gate          | $T_0 +27$   | $+.1754^{\circ}/\text{sec}$ |

The maximum yaw rate error ( $+0.175^{\circ}/\text{sec}$ ) occurred after ACS activation when the yaw tach output reached  $-520$  rpm and a minus yaw gate occurred ( $T_0 +27$ ). After the  $-$ yaw gate occurred, the yaw error rate returned to  $-0.0313^{\circ}/\text{sec}$ . The duration of each of the rate perturbations was approximately 10 seconds long. The RMP's in HI rate were out of saturation initially at ( $T_0 +43$ ), however, the  $-$ pitch and  $-$ roll gates which occurred at ( $T_0 +62$ ) momentarily disturbed the RMP's stability and the RMP's re-entered saturation. Restabilization and acquisition occurred at ( $T_0 +66$ ). Table 6-5 summarizes LANDSAT 2's yaw acquisition chronology.

Table 6-5. Yaw Acquisition Telemetry Data

| Activity                                    | Time                      | 1035<br>Yaw<br>Tach<br>Output (RPM) | 1087<br>RMP1<br>Ind. Rate<br>HI <sup>o</sup> /SEC | 1097<br>RMP2<br>Ind. Rate<br>HI <sup>o</sup> /SEC |
|---|---------------------------|-------------------------------------|---|---|
| Separation                                  | $T_0$<br>18:54:55         | 0                                   | Saturated   | Saturated   |
| Separation $+10^{\circ}$                    | $T_0$<br>18:55:05         | 0                                   | Saturated   | Saturated   |
| Activation                                  | $T_0 +17.5$<br>18:55:12.5 | 0                                   | Saturated   | Saturated   |
| (1066)<br>+Yaw Gate                         | $T_0 +20$<br>18:55:15     | -180                                | Saturated   | Saturated   |
| Max - RPM                                   | $T_0 +26$<br>18:55:21     | -465                                | Saturated   | Saturated   |
| (1067)<br>-Yaw Gate                         | $T_0 +27$<br>18:55:22     | -405                                | Saturated   | Saturated   |
| RMP's out of<br>Saturation<br>(Acquisition) | $T_0 +66$<br>18:56:01     | +650                                | $.00236^{\circ}/\text{SEC}$                       | $.00142^{\circ}/\text{SEC}$                       |

## POST SEPARATION PERFORMANCE

The ACS has performed well since launch. Following stabilization of the spacecraft, the pneumatics were disabled and pneumatic gates in pitch have occurred at a rate of  $\approx 1$  per orbit. Roll gating is  $\approx 2$  per orbit. Pneumatics unloading is accomplished by stored momentary enable commands. The commands are timed to occur in the umbra and away from the SN/SD and SD/SN transition. The remaining useable impulse at the end of orbit 29 was 537.493 lb/sec.

Yaw mode was commanded normal during Orbit 1 Alaska. RMP2 has been selected as the prime instrument, and has been enabled since launch. RMP1 was turned off in Orbit 2, Alaska.

## ACS THERMAL PERFORMANCE

Temperature and pressure have remained normal, with the forward scanner being an exception. The forward scanner developed a leak prior to launch and has continued to leak at a constant rate. At the end of 40 orbits, the SCEST mean value pressure reading for Function 1003 was 9.550 PSI.

## ACS VOLTAGES AND CURRENTS

All voltages and currents have been within specified limits (see Table 6-6).

## MAGNETIC MOMENT COMPENSATION

The Magnetic Moment Compensation system was not enabled during the first 40 orbits.

Tables 6-7 through 6-13 are offered as a summary of spacecraft performance from T/V through actual in-orbit operation.

Table 6-6. Subsystem Temperature and Pressure Averages

| Function                         | Units | Orbits              |                     |                      |
|----------------------------------|-------|---------------------|---------------------|----------------------|
|                                  |       | 0/1                 | T/V*<br>25°C Values | 29                   |
| 1084 RMP 1 Gyro Temperature      | DGC   | 79.64               | 78.5                | 19.33 <sup>(1)</sup> |
| 1094 RMP 2 Gyro Temperature      | DGC   | 76.06               | 78.0                | 74.00                |
| 1222 SAD RT MTR HSNB Temp.       | DGC   | 27.67               | 27.6                | 19.50                |
| 1242 SAD LT MTR HSNB Temp.       | DGC   | 25.68               | 26.7                | 26.87                |
| 1223 SAD RT MTR WNDNG Temp.      | DGC   | 28.82               | 28.5                | 21.76                |
| 1243 SAD LT MTR WNDNG Temp.      | DGC   | 27.26               | 26.0                | 30.23                |
| 1228 SAD RT HSG Pressure         | PSI   | 7.40                | 7.30                | 7.26                 |
| 1248 SAD LT HSG Pressure         | PSI   | 7.27                | 7.25                | 7.28                 |
| 1007 FWD Scanner MTR Temp. 2.90  | DGC   | 23.10               | 27.0                | 22.07                |
| 1016 Rear Scanner MTR Temp. 2.37 | DGC   | 26.13               | 29.0                | 24.19                |
| 1003 FWD Scanner Pressure        | PSI   | 9.57 <sup>(2)</sup> | 5.4                 | 9.59 <sup>(2)</sup>  |
| 1012 Rear Scanner Pressure       | PSI   | 6.19                | 6.86                | 6.21                 |
| 1212 Gas Tank Pressure 3.67      | PSI   | 1921.8              | 1270.0              | 1948.0               |
| 1210 Gas Tank Temperature        | DGC   | 20.33               | 23.7                | 20.66                |
| 1213 Manifold Pressure           | PSI   | 66.19               | 71.7                | 53.98                |
| 1211 Manifold Temperature        | DGC   | 19.52               | 20.5                | 19.18                |
| 1059 CLG Power Supply Card Temp. | DGC   | 36.50               | 34.0                | 39.00                |
| 1260 THO1 EBP                    | DGC   | 25.14               | 29.8                | 24.29                |
| 1261 THO2 EBP                    | DGC   | 23.42               | 29.0                | 20.29                |
| 1262 THO3 EBP                    | DGC   | 26.86               | 30.4                | 18.29                |
| 1263 THO1 STS                    | DGC   | 17.28               | NA                  | 6.54                 |
| 1264 THO2 STS                    | DGC   | D                   | NA                  | D                    |
| 1265 THO3 STS                    | DGC   | 18.84               | NA                  | 8.46                 |
| 1266 THO4 STS                    | DGC   | 16.24               | NA                  | -2.78                |
| 1267 THO5 STS                    | DGC   | 16.76               | NA                  | 9.62                 |
| 1224 SAD R FSST                  | DGC   | 15.17               | 30.0                | 35.00                |
| 1244 SAD L FSST                  | DGC   | 17.89               | 25.0                | 50.00                |

\* Thermal Vacuum Test Data

(1) RMP-1 Left off after initial test in Orbit 1

(2) Prelaunch leak - refer to text

NA = Not Applicable

D = Defective telemetry point

Table 6-7. ACS Voltages and Currents

| Function                    | Orbits |        |                     |        |
|-----------------------------|--------|--------|---------------------|--------|
|                             | Units  | 0/1    | T/V*<br>25°C Values | 29     |
| 1081 RMP 1 MTR Volts        | VDC    | 36.39  | 36.1                | OFF    |
| 1082 RMP 1 MTR Current      | Amps   | 0.26   | 0.252               | OFF    |
| 1080 RMP 1 Supply Volts     | VDC    | -23.33 | -23.7               | OFF    |
| 1091 RMP 2 MTR Volts        | VDC    | 29.82  | 30.1                | 29.99  |
| 1092 RMP 2 MTR Current      | Amps   | 0.10   | 0.108               | 0.10   |
| 1090 RMP 2 Supply Volts     | VDC    | -23.52 | -23.5               | -23.63 |
| 1220 SAD RT MTR WNDNG Volts | VDC    | -5.61  | 5.7                 | -5.47  |
| 1240 SAD LT MTR WNDNG Volts | VDC    | -5.64  | 5.7                 | -5.08  |
| 1227 SAD RT -15 VDC Conv.   | VDC    | 15.11  | 15.6                | 15.14  |
| 1247 SAD LT -15 VDC Conv.   | VDC    | 15.22  | 15.7                | 15.23  |
| 1056 CLB $\pm$ 6 VDC        | TMV    | 2.35   | 2.32                | 2.35   |
| 1055 CLB $\pm$ 10 VDC       | TMV    | 2.87   | 2.87                | 2.88   |
| 1057 CLB Power Supply Volts | TMV    | 2.95   | 2.95                | 2.97   |
| 4006 MMCA Roll Coil         | TMV    | 2.99   | 3.00**              | 2.99   |
| 4005 MMCA Pitch Coil        | TMV    | 3.12   | 3.20**              | 3.15   |
| 4004 MMCA Yaw Coil          | TMV    | 3.05   | 3.00**              | 3.05   |

\*Thermal Vacuum Test Data

\*\*20°C T/V Values

Table 6-8. Pre-Launch R/T CRT Hardcopy on the Pad

```

*****
***. REAL TIME SET ACS
***.SADECAM TIME 10/28/55 TIME 022/17/45/19 RMB 1 2
***.PBESS 7:26 7:42 PSI PNEUMATICS GYR8 T 79.64 75.50 DGC***
***.MBG T 24:09 5:54 DGC TNK P 1911.43 PSI MTR I 0.25H 0.10L AMP***
***.15 V 15:21 15:21 VDC TNK T 19.33 DGC MTR V 36.25H 29.73 PKV***
***.F SS T 15:26 15:17 DGC MAN P 72.99H PSI HTR PWR 13.42 13.00 WTS***
***.R SS T 16:99 19:64 DGC MAN T 19.17 DGC PKG T 83.50 30.50 DGC***
***.SS PRE 3:05 3:05 TMV CLB PITCH RBLL (REAR) YAW ***
***.MT W T 23:68 25:88 DGC F/W SPD -2.66 -11.53 RPM ***
***.MT W V -24:95 -24:09 VDC CRS ERR 0.35 0.00 DEG ***
***.TACH 0:18H -0:29 D/M FNE ERR 0.14 -0.26 DEG ***
***.SCANNERS FWD REAR M-D CW 0:00 4.70 5.49 0:00 PCT ***
***.FW SP 627.75 615.00 RPM M-D CCW 0:00 0:00 0:00 0:00 PCT ***
***.PBESS 9:46H 6:10 PSI PNE M8D 1.27 0:00 TMV ***
***.MTR T 21:37 25:16 DGC SBL DC 0.39 0:00 0:00 PCT ***
***.PRE T 21:36 25:56 DGC PITCH TAC 0.00 RPM ***
***.REF T 17:89 26:50 DGC YAW RATE GYR8 TEMPS=DGC CLB VOLTAGES=TMV ***
***.LEPLSE 0:95 0:00H MS SPEED 4.75 TMV BPL1 24.57 +-10V 2.87H ***
***.TRPLSE 0:00H 1:00 MS RATE 0:00 D/S BPL2 23.14 +-6V 2.35 ***
***.UP/DN 0:70 0:70 DEG HSG T 28.39 DGC BPL3 25.99 PS V 2.95H ***
*****

```

SCE1 CONSOLE 022/17/45/50

Table 6-9. Orbit 1 R/T CRT Display Hardcopy Post Launch

```

*****
***. REAL TIME SET ACS
***.SADECAM TIME 10/19/51 TIME 022/19/45/51 RMB 1 2
***.PBESS 7:26 7:42 PSI PNEUMATICS GYR8 T 70.00L 73.50L DGC***
***.HSG T 24:48 5:31 DGC TNK P 1923.78 PSI MTR I 0.21 0.10 AMP***
***.15 V 15:19 15:21 VDC TNK T 20.33 DGC MTR V 32.69 30.01 PKV***
***.F SS T 16:84 7:00 DGC MAN P 54.35 PSI HTR PWR 0.07 6.29 WTS***
***.R SS T 16:49 -0:54 DGC MAN T 18.83 DGC PKG T 30.32 28.24 DGC***
***.SS PRE 1:67 3:05 TMV CLB PITCH RBLL (REAR) YAW ***
***.MT W T 26:66 27:05 DGC F/W SPD -122.66 1406.90 RPM ***
***.MT W V -8:23H -5:18 VDC CRS ERR 0:00 0.00 DEG ***
***.TACH 10:51 3:28H D/M FNE ERR -0.12 -0.60H DEG ***
***.SCANNERS FWD REAR M-D CW 0:00 5.09 10.19 0:00 PCT ***
***.FW SP 622.22 1026.06 RPM M-D CCW 2.35 0:00 0:00 100.00 PCT ***
***.PBESS 9:68H 6:30 PSI PNE M8D 1.25 -0.20 TMV ***
***.MTR T 24:52 25:80 DGC SBL DC 0:00 0:00 0:00 PCT ***
***.PRE T 23:68 26:93 DGC PITCH TAC 0.17 RPM ***
***.REF T 19:64 29:16 DGC YAW RATE GYR8 TEMPS=DGC CLB VOLTAGES=TMV ***
***.LEPLSE 13:80 12:00 MS SPEED 0:00 TMV BPL1 23.71 +-10V 2.87H ***
***.TRPLSE 12:30 14:00 MS RATE 2:00 D/S BPL2 22.28L +-6V 2.35 ***
***.UP/DN 0:70 0:70 DEG HSG T 24.64 DGC BPL3 24.57 PS V 2.95H ***
*****

```

SCE1 CONSOLE 022/19/52/54

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Table 6-10. Attitude Control System Alignment Data (Prelaunch)

| <u>Control Axes to Spacecraft Axes</u> | <u>Spec</u>       | <u>Measured</u>       |
|--|-------------------|-----------------------|
| Pitch Axis                             | 0.25 <sup>o</sup> | -2' 6"                |
| Roll Axis                              | 0.25 <sup>o</sup> | +0' 9"                |
| Yaw Axis                               | 0.25 <sup>o</sup> | -0' 51"               |
| <u>Pneumatic Nozzles</u>               | <u>Spec</u>       | <u>Measured (Max)</u> |
| Pitch                                  | 40'               | 4'                    |
| Roll                                   | 40'               | 2'                    |
| Yaw                                    | 40'               | 7.5'                  |

Table 6-11. Unfold Subsystem

| <u>Components</u>                                 |               |                                |
|---|---------------|--------------------------------|
| Unfold Timer                                      | S/N 6549349   |                                |
| Unfold Switch                                     | S/N 4-32116   |                                |
| Separation Switches                               | S/N 209 & 211 |                                |
| Unfold Motors                                     | S/N 112 & 113 |                                |
| Cable Cutter Assembly                             | S/N 55 & 81   |                                |
| <u>Performance</u>                                | <u>Spec</u>   | <u>Pre-Launch Measurements</u> |
| Unfold Timer Fire Time 1                          | 2.7 ± 0.6 Sec | 2.8 Sec                        |
| Unfold Timer Fire Time 2                          | 5.3 ± 1.2 Sec | 5.65 Sec                       |
| Squib Fire Current 2                              | ≥ 4 Amp Ea.   | 7 Amp Ea.                      |
| Squib Fire Current 2                              | ≥ 4 Amp Ea.   | 7 Amp Ea.                      |
| Paddle Open Time (-Y)                             | ≤ 40 Sec      | 25.2 Sec                       |
| (+Y)  | ≤ 25 Sec      | 16.2 Sec                       |
| <u>Pre-Launch Problem Summary</u>                 |               |                                |
| No Problems Throughout Environmental Test Program |               |                                |

Table 6-12. Attitude Control Subsystem

| <u>Parameter</u>        | <u>Spec</u>                        | <u>Pre-Launch Measurement</u> |
|-------------------------|------------------------------------|-------------------------------|
| 15 Second Timer         | 14.4 to 18 Sec                     | 16 Secs                       |
| 50 Second Timer         | 42.5 to 57.5 Sec                   | 51 Secs                       |
| Pitch Pneu. Threshold   | $5.5^{\circ} \pm 0.8^{\circ}$      | $5.85^{\circ}$                |
| Roll Pneu. Threshold    | $5.1^{\circ} \pm 0.8^{\circ}$      | $5.7^{\circ}$                 |
| Yaw Pneu. Threshold     | 0.07 to $0.13^{\circ}/\text{Sec}$  | $0.103^{\circ}/\text{Sec}$    |
| Pitch Position Bias     | $4.7 \pm 0.5^{\circ}$              | $5.0^{\circ}$                 |
| Yaw Position Bias       | $1.0^{\circ}$ (Trend)              | $0.978^{\circ}$               |
| Left Solar Array Drive  |                                    |                               |
| Normal Rate             | $3.33 \pm 0.33^{\circ}/\text{Min}$ | $3.30^{\circ}/\text{Min}$     |
| High Rate               | $3.90 \pm 0.4^{\circ}/\text{Min}$  | $3.90^{\circ}/\text{Min}$     |
| Right Solar Array Drive |                                    |                               |
| Normal Rate             | $3.33 \pm 0.33^{\circ}/\text{Min}$ | $3.45^{\circ}/\text{Min}$     |
| High Rate               | $3.9 \pm 0.4^{\circ}/\text{Min}$   | $4.04^{\circ}/\text{Min}$     |
| Momentum Bias Speed     | $1060 \pm 150$ RPM                 | 1000 RPM                      |
| Pneumatics              |                                    |                               |
| Primary Seat Leak       | 1 SCC/Hr                           | 0.12 SCC/Hr                   |
| External Leak           | 10 SCC/Hr                          | < 0.1 SCC/Hr                  |

Table 6-13. Attitude Control Subsystem LANDSAT-2 Performance

|       | <u>Spacecraft Goals</u> |                            |
|-------|-------------------------|----------------------------|
|       | <u>Attitude</u>         | <u>Rate</u>                |
| Roll  | $0.7^{\circ}$           | $0.015^{\circ}/\text{Sec}$ |
| Pitch | $0.7^{\circ}$           | $0.015^{\circ}/\text{Sec}$ |
| Yaw   | $1.0^{\circ}$           | $0.015^{\circ}/\text{Sec}$ |

**SECTION 7**

**TELEMETRY SUBSYSTEM**



SECTION 7  
TELEMETRY SUBSYSTEM

The Narrow Band Telemetry samples, encodes, formats, and transmits data from spacecraft service and payload subsystem to earth receiving stations. The subsystem processes and coherently retransmits an S-Band signal, including a ranging code for use in orbit determination. The subsystem provides timing and synchronizing signals to spacecraft service and payload subsystems. See Figure 7-1 and 7-2 for functional block diagram, and Figure 7-3 for hardware illustration. The units in this subsystem are closely associated with those described in Section 11, Unified S-Band/Premodulation Processor, and Section 8, Command/Clock Subsystem.

The Telemetry subsystem was launched in the ON mode and has been operating continuously providing data from the spacecraft either to ground stations, to the narrow band recorders, or to both. The launch configuration is given in Table 7-1 and typical telemetry values in Table 7-2. Total performance has been excellent. Prelaunch performance is shown in Table 7-3 for the VHF transmitter.

Table 7-1. Telemetry Subsystem Launch Mode

|             | MODE | CMD |                 | MODE | CMD |
|-------------|------|-----|-----------------|------|-----|
| POWER 1     | ON   | 522 | ANALOG MUX      | A    | 262 |
| POWER 2     | ON   | 520 | DIGITAL MUS     | A    | 300 |
| MEM WRITE   | OFF  | 361 | MEMORY          | A    | 240 |
| VER MEM     | OFF  | 422 | FOR LOG         | A    | 302 |
| MTX VER O/R | ON   | 341 | VHF XMTR        | YES  | 400 |
| B, t 1      | OFF  | 401 | VHF XMTR O/R    | ON   | 342 |
| B, t 0      | OFF  | 343 |                 |      |     |
| FOR PROG    | ON   | 462 | VHF Transmitter |      |     |
| MTX VER     | NORM | 502 |                 |      |     |
| MEM/VER O/R | ON   | 500 | VHF MODE        | RT   | 207 |
| PRE REG ON  | A    | 460 | VHF PB O/R      | ON   | 230 |
| PRE REG OUT | A    | 463 | VHF RF PWR      | LO   | 210 |
| BUFF AMP    | A    | 440 | VHF PWR 1       | ON   | 206 |
| SEL SEQ     | A    | 242 | VHF PWR 2       | ON   | 170 |
| A/D CONV    | A    | 260 | VHF XMTR        | A    | 231 |

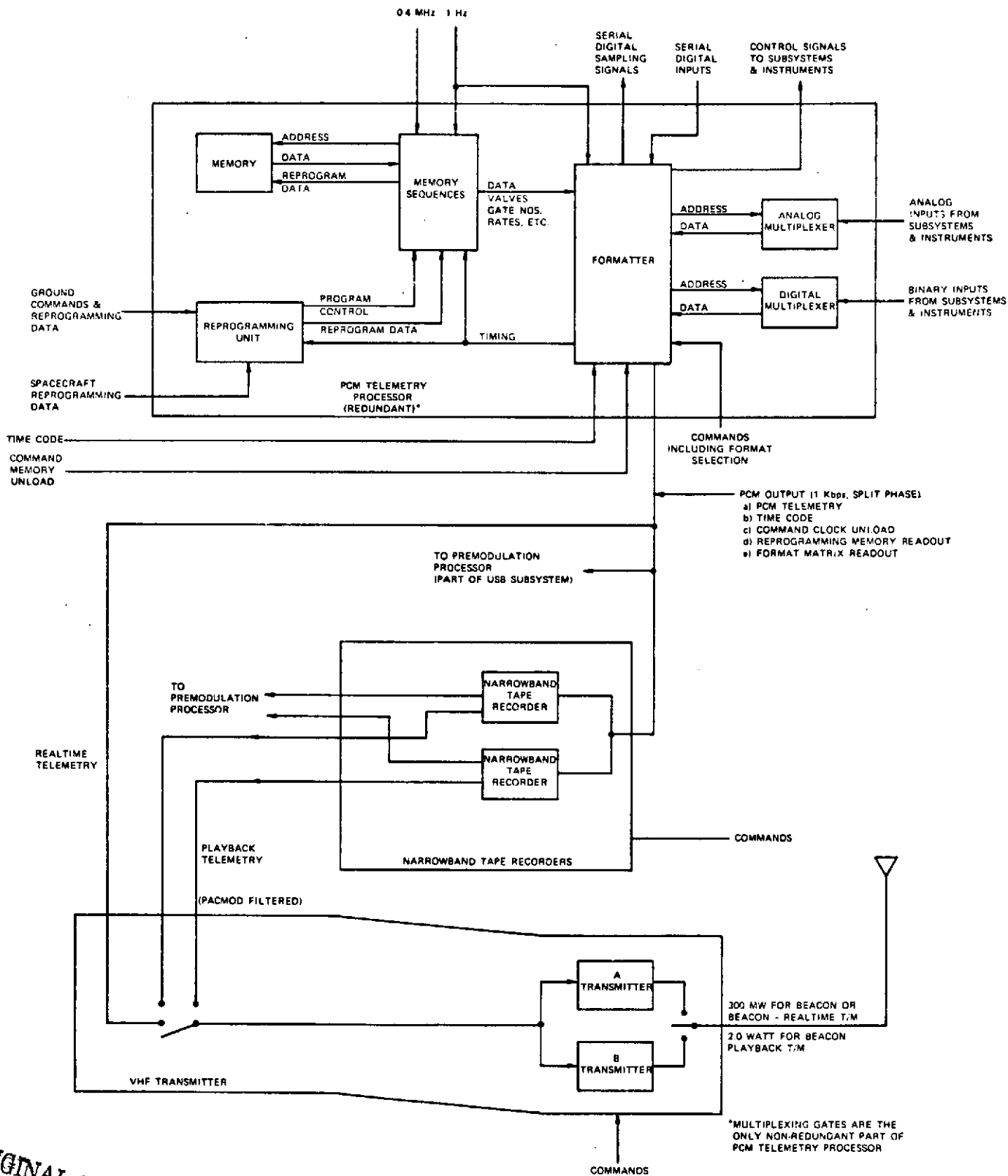


Figure 7-1. Narrowband Telemetry Block Diagram

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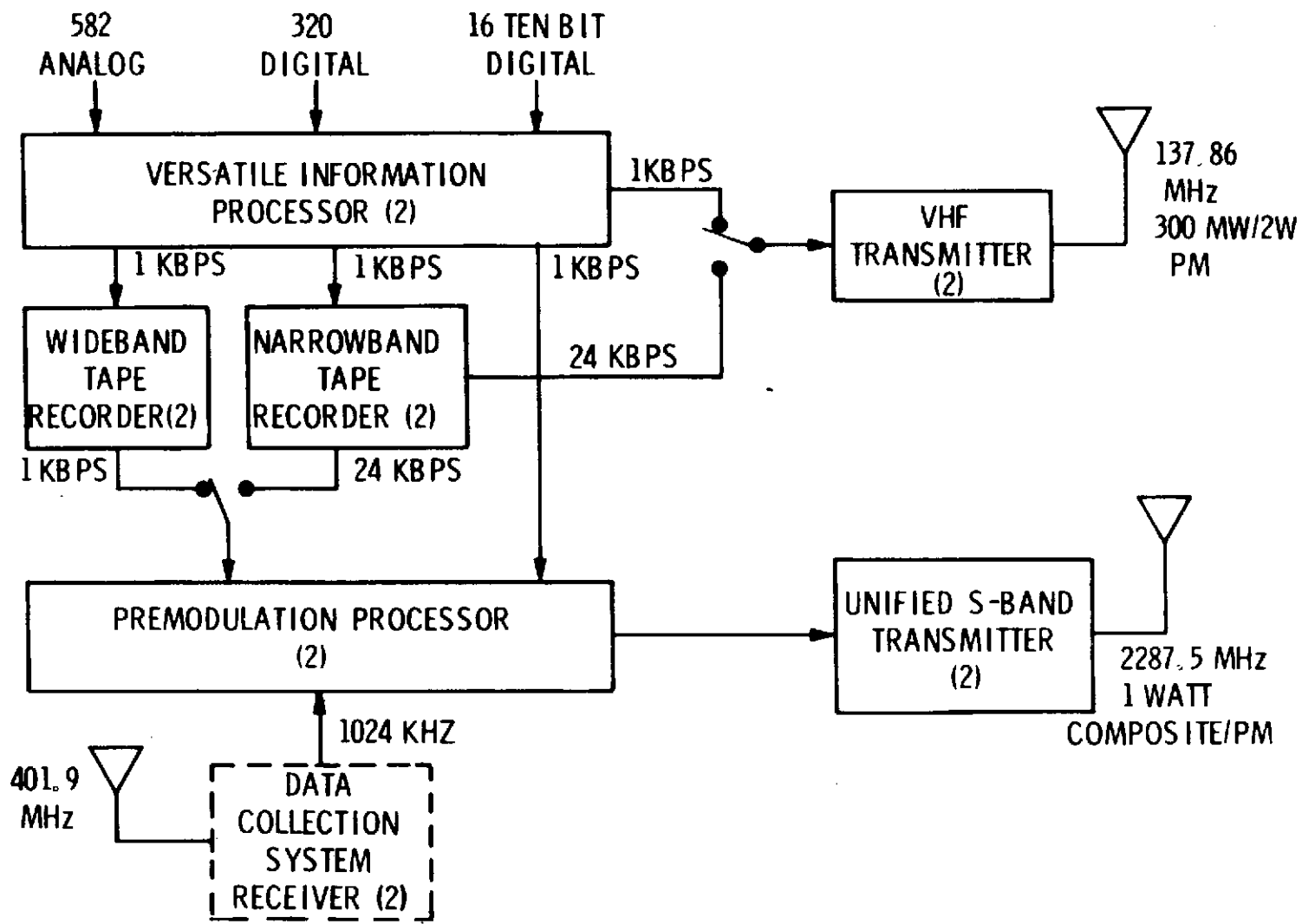


Figure 7-2. Narrowband Telemetry and Command Subsystem Block Diagram (Down Link)

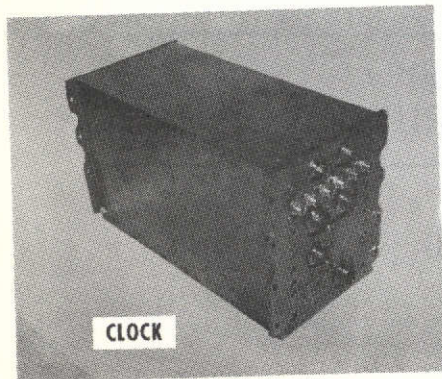
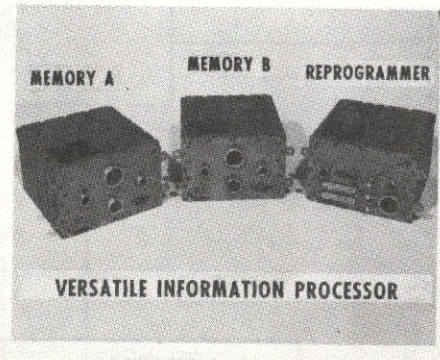
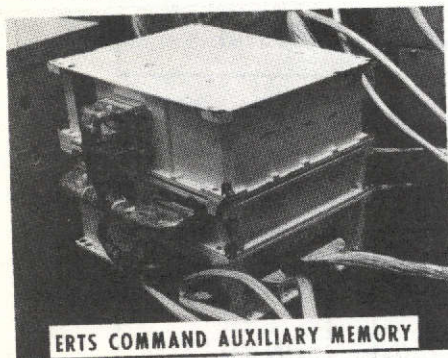
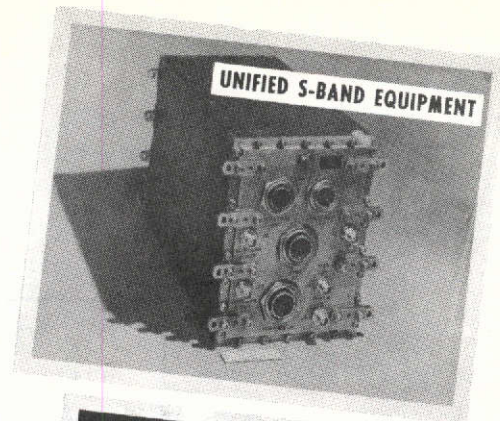
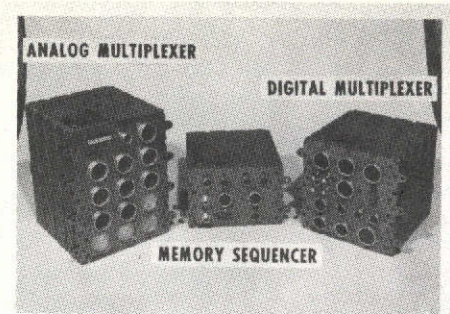


Figure 7-3. Narrowband Telemetry and Command Subsystem

Table 7-2. TMP Telemetry Values

| Function No. | Function Name                | Unit | Orbit O-1 | T/V*<br>20° Plateau | Orbit 35 |
|--------------|------------------------------|------|-----------|---------------------|----------|
| 9001         | Memory Sequencer A Converter | VDC  | 4.45      | 4.46                | 4.45     |
| 9002         | Memory Sequencer B Converter | VDC  | OFF**     | 4.55                | OFF**    |
| 9003         | Memory Sequencer Temp        | °C   | 15.00     | 25.00               | 20.00    |
| 9004         | Formatter A Converter        | VDC  | 4.50      | 4.50                | 4.52     |
| 9005         | Formatter B Converter        | VDC  | OFF**     | 4.55                | OFF**    |
| 9006         | Dig. Mux A Converter         | VDC  | 4.20      | 4.22                | 4.22     |
| 9007         | Dig. Mux B Converter         | VDC  | OFF**     | 4.20                | OFF**    |
| 9008         | Formatter/Dig Mux Temp       | °C   | 17.50     | 25.00               | 25.00    |
| 9009         | Analog Mux A Converter       | VDC  | 4.02      | 4.02                | 4.02     |
| 9010         | Analog Mux B Converter       | VDC  | OFF**     | 3.87                | OFF**    |
| 9011         | A/D Converter A Voltage      | VDC  | 4.02      | 4.02                | 4.02     |
| 9012         | A/D Converter B Voltage      | VDC  | OFF**     | 4.07                | OFF**    |
| 9013         | Analog Mux, A/D Conv. Temp   | °C   | 17.50     | 28.00               | 25.00    |
| 9014         | Preregulator A Voltage       | VDC  | 3.99      | 3.99                | 4.00     |
| 9015         | Preregulator B Voltage       | VDC  | OFF**     | 4.01                | OFF**    |
| 9016         | Reprogrammer Temp            | °C   | 17.50     | 22.00               | 22.50    |
| 9017         | Memory A Converter           | VDC  | 4.45      | 4.45                | 4.45     |
| 9018         | Memory A Temp                | °C   | 12.50     | 17.00               | 17.50    |
| 9019         | Memory B Converter           | VDC  | OFF**     | 4.50                | OFF**    |
| 9020         | Memory B Temp                | °C   | 12.50     | 17.3                | 17.50    |
| 9100         | Reflected Power (Xmtr A)     | dBm  | 15.29     | 14.7                | 18.29    |
| 9101         | Xmtr A-20 VDC                | VDC  | 3.97      | 3.97                | 3.80     |
| 9103         | Xmtr A Temp                  | °C   | 23.59     | 20.5                | 27.73    |
| 9105         | Xmtr A Power Output          | dBm  | 25.79     | 25.7                | 27.73    |

\* Thermal Vacuum Test data

\*\* Not turned on since Prelaunch

Table 7-3. VHF Transmitter

| <u>Component</u>       |         |             |          |          |
|------------------------|---------|-------------|----------|----------|
| VHF Transmitter        | FT 0004 |             |          |          |
| Pre-Launch Performance |         |             |          |          |
| 1 KBPS real time       |         | Data Good   |          |          |
| 24 KBPS playback       |         |             |          |          |
|                        |         | <u>Spec</u> | <u>A</u> | <u>B</u> |
| Power Output-Low Mode  |         | 300 MV      | 365 MW   | 390 MW   |
| High Mode              |         | 2 W         | 2.8 W    | 2.9 W    |

**SECTION 8**

**COMMAND/CLOCK SUBSYSTEM**

SECTION 8  
COMMAND/CLOCK SUBSYSTEM

The Command and Clock Subsystem consists of the following modules: VHF Receiver; Command Integration; Command Clock; and ECAM. The first three modules are located in the sensory ring, and ECAM is located inside the USB antenna mount. Parts of two other modules (Unified S-Band Equipment and Premodulation Processor) provide one of the two primary inputs to the Command and Clock Subsystem, but are not considered part of the subsystem.

The Command and Clock Subsystem performs the following functions:

1. Receives, processes, and stores command information from the USB and VHF ground station.
2. Receives, processes, and stores command information from the USB and VHF ground stations and executes these commands at the predetermined time.
3. Receives and transfers serial data to the TMP for reprogramming its memory.
4. Provides an accurate time base upon which all spacecraft activities can be planned, referenced, and measured.
5. Generates Minitrack 36-bit time code data which is stored and transmitted with TMP, RBV, and MSS data so that the time reference cited above may be used to process data in the ground station.
6. Generates standard frequencies and motor drive signals used by other subsystems.

The LANDSAT-2 System Command Matrix provides for 512 commands as noted in Appendix B.

Figure 8-1 is a simplified block diagram and Figure 8-2 is a modulation format.

The LANDSAT-2 command subsystem was launched in the configuration given in Table 8-1, and activated with the separation and unfold contact closure which occurred at 18:54:55 near Tananarive in orbit 0.



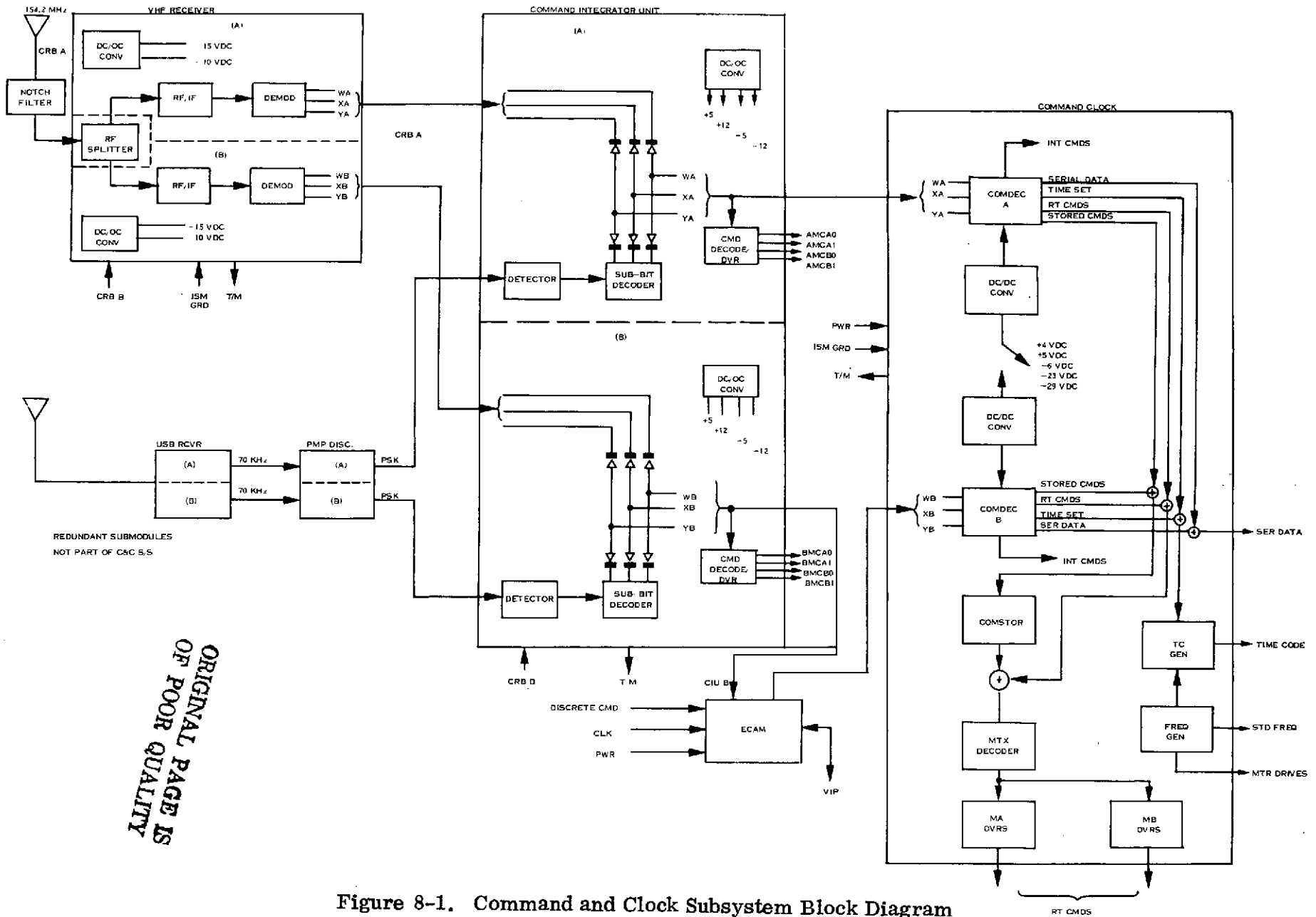


Figure 8-1. Command and Clock Subsystem Block Diagram

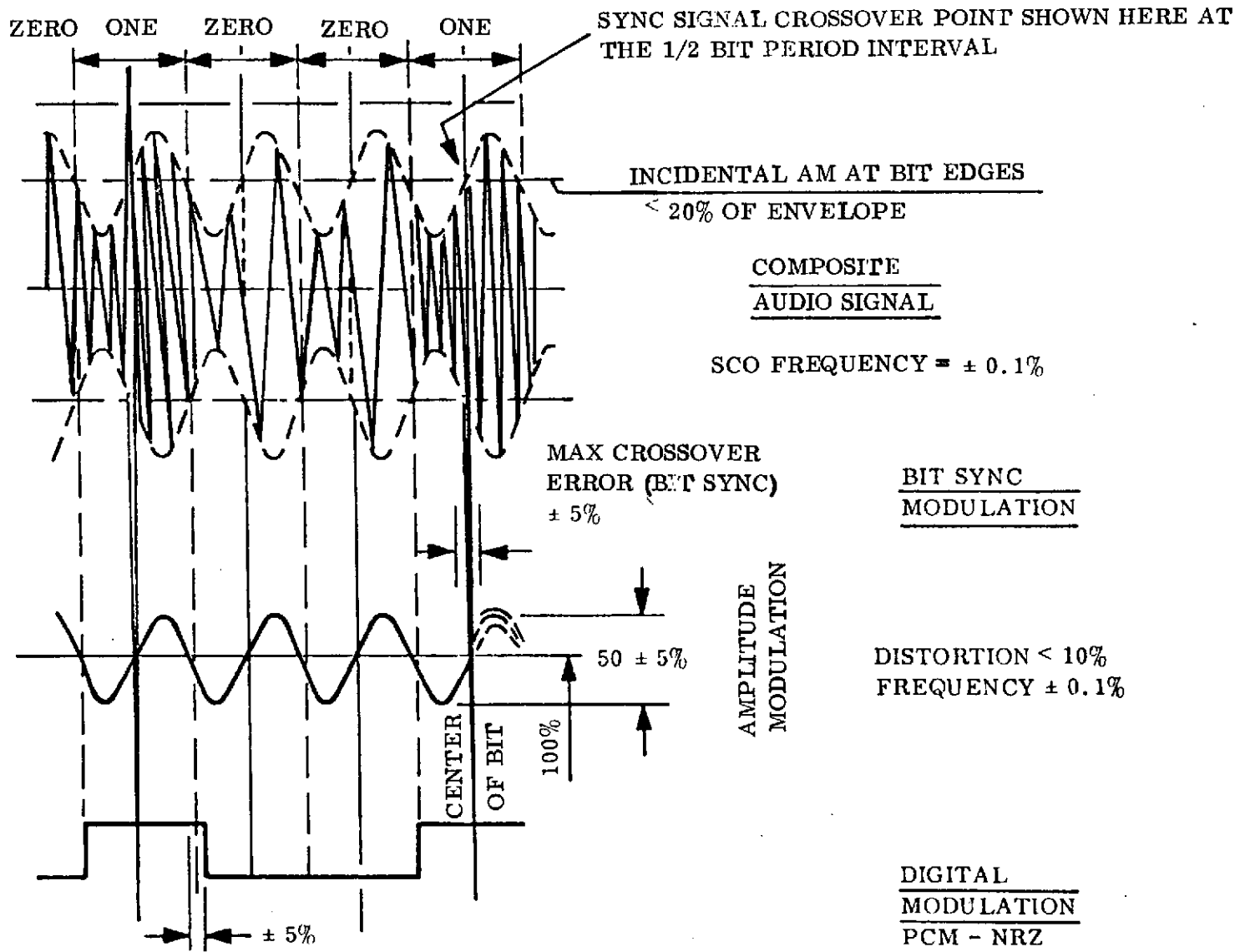


Figure 8-2. Composite STADAN Audio Waveform

Table 8-1. Command/Clock Subsystem Launch Mode

|              | Mode | Cmd |
|--------------|------|-----|
| COMSTOR A    | OFF  | 055 |
| COMSTOR B    | OFF  | 025 |
| MTX DECODER  | PR1  | 011 |
| MTX A DRIVE  | PR1  | 012 |
| MTX B DRIVE  | PR1  | 013 |
| OSCILLATOR   | PR1  | 014 |
| FREQ. GEN    | PR1  | 015 |
| VERIFY       | TOCK | 457 |
| MSFN/STADAN  | A/B  | 616 |
| CLOCK FUSE   | 1A   | 653 |
| CIU CH B     | ON   | 782 |
| CIU CH A     | ON   | 786 |
| CLOCK PS/COM | ON   | 783 |
| ECAM         | OFF  |     |

A summary of telemetry values is provided in Table 8-2. Flight data correlates very closely with Thermal Vacuum test data values. Ground software problems are delaying availability of some of the telemetry.

Command processing of both real time and stored commands have been normal. No spurious or unexecuted commands have been observed. (Some commanding difficulties have been experienced, but all cases have been coincidental with low elevation at the station, lock on side lobes, or similar ground transmission difficulties.)

The time base provided for spacecraft activities planning has been well within specifications during this period. Clock drift has been less than -2 MS per orbit during this period.

Spacecraft time code, transmitted via RBV, MSS, and Tlm has been reliable and accurate.

All frequency outputs to other subsystems have been nominal.

Table 8-3 shows the pre-launch performance of the Command Clock subsystem.

Table 8-2. Command/Clock Telemetry Summary

| Function No. | Name                    | Mode          | Units | Orbit 0/1 | Thermal Vac 20° Plateau | Orbit 35 |
|--------------|-------------------------|---------------|-------|-----------|-------------------------|----------|
| 8005         | Pri. Power Supply Temp. | -             | °C    | 29.93     | 37.89                   | 38.82    |
| 8006         | Red. Power Supply Temp. | -             | °C    | 27.61     | 36.31                   | 36.93    |
| 8007         | Pri. Osc. Temp.         | -             | °C    | 24.35     | 27.84                   | 28.70    |
| 8008         | Red Osc. Temp.          | -             | °C    | 23.48     | 26.95                   | 27.82    |
| 8009         | Pri. Osc. Output        | -             | TMV   | 1.02      | 1.06                    | 1.06     |
| 8010         | Red. Osc. Output        | -             | TMV   | 0.0       | 1.16                    | 3.20     |
| 8011         | 100 KHz                 | Pri. - Red.   | TMV   | 3.15      | 3.16                    | 3.17     |
| 8012         | 10 KHz                  | Pri. - Red.   | TMV   | 3.04      | 3.05                    | 3.08     |
| 8013         | 2.5 KHz                 | Pri. - Red.   | TMV   | 2.95      | 2.96                    | 3.01     |
| 8014         | 400 Hz                  | Pri. - Red.   | TMV   | 4.43      | 4.45                    | 4.17     |
| 8015         | Pri. / 4V Power Supply  | Pri. Clk ON   | VDC   | NA        | 2.05                    | NA       |
| 8016         | Red. / 4V Power Supply  | Red. Clk ON   | VDC   | NA        | 2.01                    | NA       |
| 8017         | Pri. / 6V Power Supply  | Pri. Clk ON   | VDC   | NA        | 2.31                    | NA       |
| 8018         | Red. / 6V Power Supply  | Red. Clk ON   | VDC   | NA        | 2.31                    | NA       |
| 8019         | Pri. - 6V Power Supply  | Pri. Clk ON   | VDC   | NA        | 5.23                    | NA       |
| 8020         | Red. - 6V Power Supply  | Red. Clk ON   | VDC   | NA        | 5.23                    | NA       |
| 8021         | Pri. - 23V Power Supply | Pri. Clk ON   | VDC   | NA        | 5.70                    | NA       |
| 8022         | Red. - 23V Power Supply | Red. Clk ON   | VDC   | NA        | 5.66                    | NA       |
| 8023         | Pri. - 29V Power Supply | Pri. Clk ON   | VDC   | NA        | 5.29                    | NA       |
| 8024         | Red. - 29V Power Supply | Red. Clk ON   | VDC   | NA        | 5.28                    | NA       |
| 8101         | CIU A - 12V             | CIU A ON      | VDC   | 3.96      | 3.96                    | 3.79     |
| 8102         | CIU B - 12V             | CIU B ON      | VDC   | 3.95      | 3.95                    | 3.78     |
| 8103         | CIU A - 5V              | CIU A ON      | VDC   | 4.14      | 4.15                    | 3.93     |
| 8104         | CIU B - 5V              | CIU B ON      | VDC   | 4.10      | 4.10                    | 3.90     |
| 8105         | CIU A Temp.             | CIU A ON      | °C    | 20.69     | 22.52                   | 26.01    |
| 8106         | CIU B Temp.             | CIU B ON      | °C    | 18.98     | 20.52                   | 23.35    |
| 8201         | Receiver RF-A Temp.     | -             | °C    | NA        | 30.05                   | NA       |
| 8202         | Receiver RF-B Temp.     | -             | °C    | 28.18     | 26.08                   | 29.09    |
| 8203         | D MOD A Temp.           | -             | °C    | 26.05     | 39.03                   | 28.95    |
| 8204         | D MOD B Temp.           | -             | °C    | 35.68     | 29.18                   | 37.73    |
| 8205         | Receiver A AGC          | Receiver A ON | DBM   | OFF**     | -56.94                  | OFF**    |
| 8206         | Receiver B AGC          | Receiver B ON | DBM   | -85.72    | -61.46                  | -87.83   |
| 8207         | Amp. A Output           | Receiver A ON | TMV   | OFF**     | 1.49                    | OFF**    |
| 8208         | Amp. B Output           | Receiver B ON | TMV   | 1.76      | 1.55                    | 2.10     |
| 8209         | Freq. Shift Key A Out   | Receiver A ON | TMV   | OFF**     | 1.08                    | OFF**    |
| 8210         | Freq. Shift Key B Out   | Receiver B ON | TMV   | 1.10      | 1.11                    | 1.11     |
| 8211         | Amp. A Output           | Receiver A ON | TMV   | OFF**     | 1.11                    | OFF**    |
| 8212         | Amp. B Output           | Receiver B ON | TMV   | 1.13      | 1.13                    | 1.13     |
| 8215         | D MOD A - 15V           | Receiver A ON | TMV   | OFF**     | 4.87                    | OFF**    |
| 8216         | D MOD B - 15V           | Receiver B ON | TMV   | 4.77      | 4.78                    | 4.77     |
| 8217         | Regulator A - 10V       | Receiver A ON | TMV   | OFF**     | 5.40                    | OFF**    |
| 8218         | Regulator B - 10V       | Receiver B ON | TMV   | 5.30      | 5.33                    | 5.32     |

\* Thermal Vacuum Test Data

\*\* A component not used since Pre-launch

NA - not available due to processing problem - MIT 710

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Table 8-3. Command and Clock Subsystem Pre-Launch Performance Summary

- ALL OPERATIONAL MODES EXERCISED SATISFACTORILY
- BOTH COMSTORS OPERATED. ALL STORED COMMANDS EXECUTED PROPERLY
- ALL CIU COMMANDS EXECUTED PROPERLY
- NO TIME CODE OR CLOCK FREQUENCY ANOMALIES
- ALL SERIAL DATA COMMANDS TO ECAM OPERATED PROPERLY
- ALL ECAM STORED COMMAND LOCATIONS (512) EXERCISED. ALL ECAM STORED COMMANDS EXECUTED PROPERLY.
- ALL ECAM SMART FUNCTIONS EXERCISED AND FUNCTIONED PROPERLY.
- VHF RCVR THRESHOLD

| <u>SPEC</u> | <u>A</u> | <u>B</u> | <u>MARGIN</u> |
|-------------|----------|----------|---------------|
| -107 DBM    | -108 DBM | -107 DBM | 31.6 DB       |

PROBLEM

RESOLUTION

CIU

- NONE

VHFR

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• AGC VARIES WITH TEMPERATURE. TRACKING SINCE LAST REVIEW.</li> </ul> | <ul style="list-style-type: none"> <li>• NO PROBLEM - REPEATABLE AT ANY GIVEN TEMPERATURE. HAS NOT CHANGED, DOES NOT AFFECT SPACECRAFT OPERATION. ACCEPT AS IS.</li> </ul> |
|--|--|

ECAM

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• STOPS PROCESSING DATA WHEN REDUNDANT SYSTEM SWITCHED IN (EBPR 268, 5/29/74).</li> <li>• SMART FUNCTIONS EXECUTED WHEN VIP RECONFIGURED (EBPR 309, 6/1/74).</li> </ul> | <ul style="list-style-type: none"> <li>• INTERRUPTS CAUSED BY RE-CONFIGURATION OF COMMAND CLOCK AND/OR VIP. RESTRAINT ADDED.</li> <li>• INADEQUATE SYNC CRITERIA. CRITERIA MADE TIGHTER - PROBLEM RESOLVED. SOFTWARE MODIFIED TO SOLVE PROBLEM.</li> </ul> |
|--|--|

COMMAND CLOCK

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• POWER SUPPLY INSTABILITY AT HIGH TEMPERATURE (P/S TEMP 50°C) AND LIGHTLY LOADED, (EBPR 276, 5/29/74 MR D08198).</li> <li>• EXECUTED "COMP LOAD #2 ON" COMMAND WHEN THE REDUNDANT CLOCK P/S WAS TURNED ON. EBPR (530, 10/25/74).</li> </ul> | <ul style="list-style-type: none"> <li>• UNIT REMOVED FROM SPACECRAFT AND RETURNED TO CAL COMP FOR REPAIR. (PRIOR TO T/V #2).</li> <li>• PROBABLY CAUSED BY NOISE AT P/S TURN-ON. HAS NEVER REPEATED. CLOCK P/S TURN ON IS NOT A NORMAL OPERATIONAL EVENT (BOTH SUPPLIES ON AT LAUNCH AND REMAIN ON).</li> </ul> |
|---|--|

**SECTION 9**  
**ORBIT ADJUST SUBSYSTEM (OAS)**

SECTION 9  
ORBIT ADJUST SUBSYSTEM (OAS)

The Orbit Adjust Subsystem (OAS) is a monopropellant hydrazine fueled propulsion system consisting of three thruster assemblies, a propellant feed system, a support structure and the necessary interconnect plumbing, brackets, and electrical harnessing. The propellant feed system consists of a single tank for storage of both the propellant and pressurant. The feed system operates in a blow-down mode during which the engine thrust decays from an initial level of 0.85 LB<sub>f</sub> to a final value of 0.25 LB<sub>f</sub> as the 67 LB<sub>m</sub> of propellant is consumed.

The operation of the propulsion subsystem permits the flow of hydrazine propellant into a combustion chamber containing a catalyst. Within the chamber, the catalyst spontaneously decomposes the hydrazine into ammonia, hydrogen, and nitrogen gases having a temperature of approximately 1800<sup>o</sup>F. These gases are then expanded through a conical nozzle to produce thrust. See Figures 9-1 and 9-2 for functional block diagrams and Figure 9-3 for hardware configuration.

The OAS was launched in the OFF mode and remained OFF except as noted in Table 9-1.

Table 9-1.

| Orbit                                | Burn Time (Sec) | Semi Major Axis** (KM) | Performance % of Plan | N <sub>2</sub> H <sub>4</sub> Used (LB <sub>m</sub> ) |
|--------------------------------------|-----------------|------------------------|-----------------------|---|
| -*                                   | -               | 7286.462               | -                     | -   |
| 32                                   | 4.8             | 7286.501               | 105.41                | 0.02  |
| 71                                   | 4.8             | 7286.434               | 90.00                 | 0.02  |
| 79                                   | 420             | 7289.977               | 107.07                | 1.62  |
| 86                                   | 420             | 7293.191               | 107.02                | 1.51  |
| 163                                  | 420             | 7290.237               | 97.00                 | 1.42  |
| 191                                  | 360             | 7287.816               | 97.58                 | 1.15  |
| 212                                  | 308.8           | 7285.820               | 101.52                | 0.95  |
| Average Force ≈ 0.79 LB <sub>f</sub> |                 |                        |                       |   |

\*After Injection

\*\*Post Burn

In Orbit 32 a 4.8 sec burn was performed to test the alignment of the -X thruster. A similar firing was performed later in Orbit 71 on the +X thruster. In both cases the firing was normal. In Orbit 79 an orbit adjust sequence for LANDSAT-2 was initiated to phase the satellite with LANDSAT-1 in the 18 day ground track repeat cycle. A firing on the -X thruster in this orbit lasted for 420 seconds, and was normal in all respects. In Orbit 86 the -X thruster was again fired for a duration of 420 sec, which brought the semi-major axis of the orbit to 7293.19 km. Later, in Orbits 163 and 191, the +X thruster was fired for a duration of 420 and 360 seconds respectively. The final maneuver in this sequence was performed with a firing on the +X thruster in Orbit 212. The burn lasted for 308.8 seconds. Tracking data has confirmed satisfactory achievement of all objectives of this orbit adjust sequence. A summary of the orbit adjust maneuvers is given in Table 9-1. The typical performance characteristics of the +X and -X thrusters are shown in Figures 9-4 thru 9-7.

Housekeeping functions of the OAS were normal. Table 9-2 gives average telemetry values for the OFF quiescent state.

Table 9-2. OAS Telemetry Values

| Function |                                | Units | Average Values |               |          |
|----------|--------------------------------|-------|----------------|---------------|----------|
| No.      | Name                           |       | Orbit 0-1      | 20°C Plateau* | Orbit 50 |
| 2001     | Prop. Tank Temp.               | °C    | 18.35          | 19.0          | 23.03    |
| 2003     | Thrust Chamber No. 1 (-x) Temp | °C    | 25.38          | 19.7          | 24.84    |
| 2004     | Thrust Chamber No. 2 (+x) Temp | °C    | 20.47          | 18.3          | 37.34    |
| 2005     | Thrust Chamber No. 3 (-y) Temp | °C    | 40.33          | 18.0          | 47.22    |
| 2006     | Line Pressure                  | Psia  | 531.71         | 15.0**        | 545.60   |

\*Thermal Vacuum Test Data. The Thruster Chamber heaters were duty cycled to maintain the chamber temperatures between +5°C and +40°C.

\*\* (Orbit Adjust Tank not Loaded)



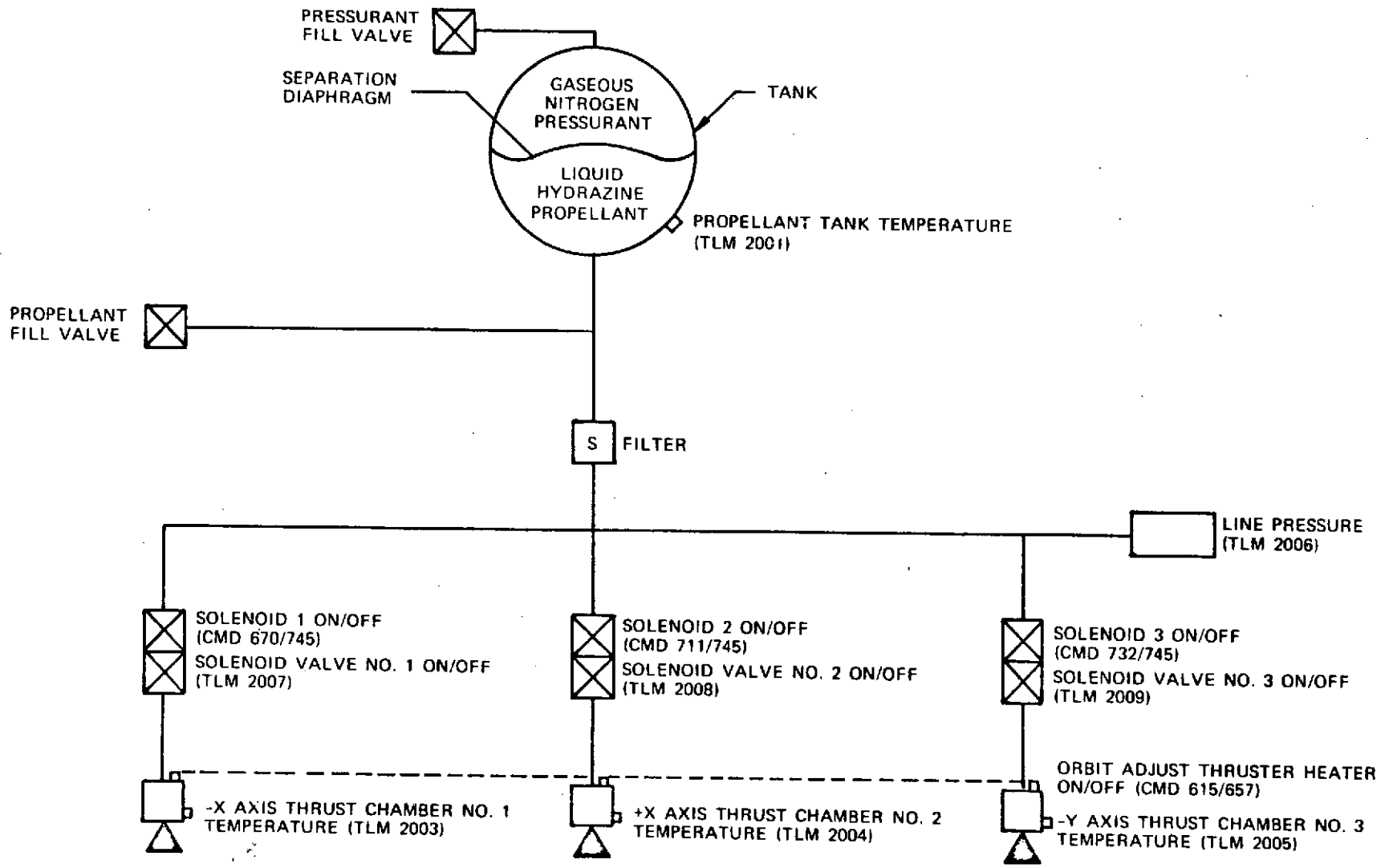


Figure 9-1. Orbit Adjust Subsystem Block Diagram

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THRUSTER UTILIZATION

- #1 - ALTITUDE CORRECTION
- #2 - ALTITUDE CORRECTION
- #3 - INCLINATION CORRECTION

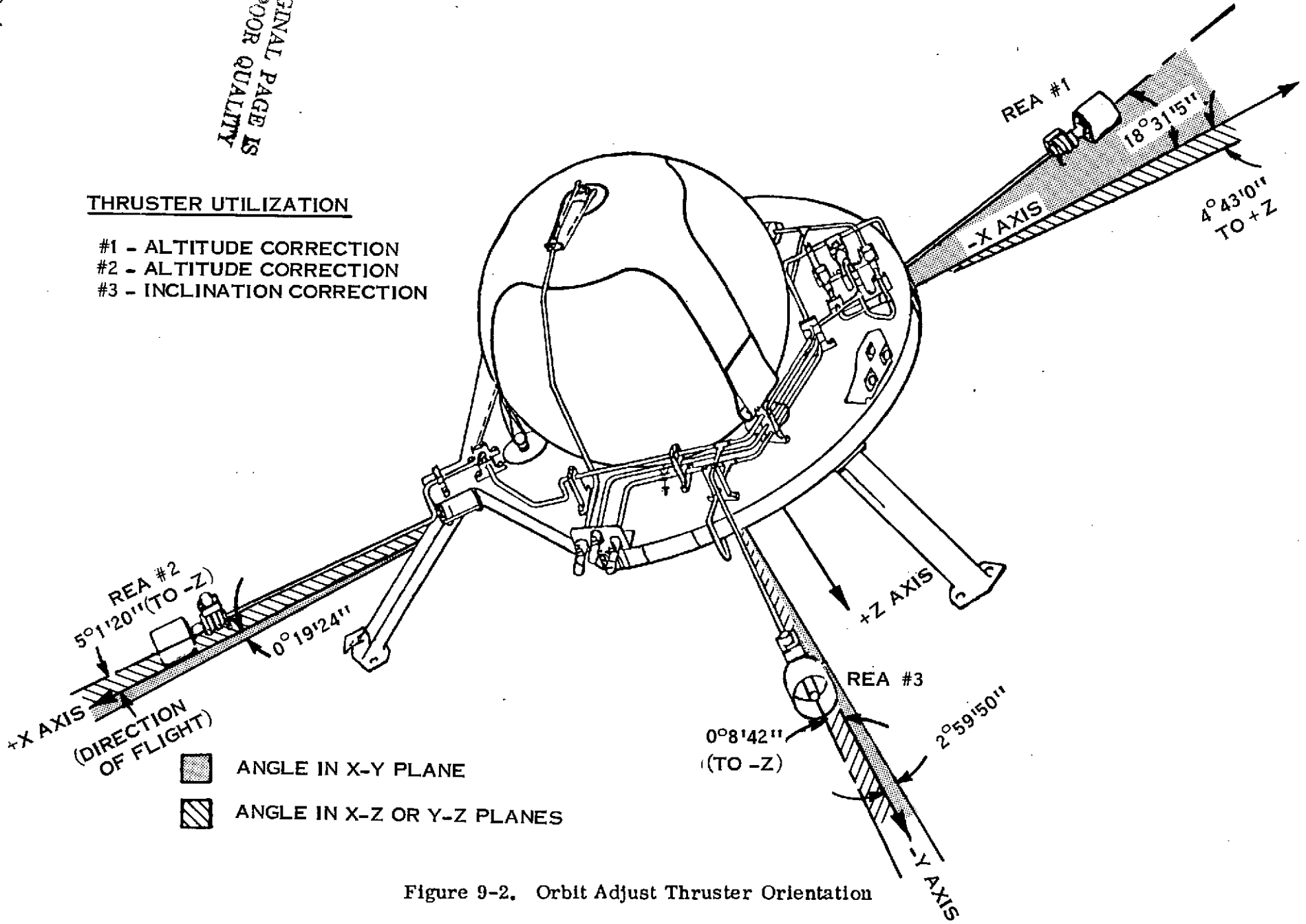


Figure 9-2. Orbit Adjust Thruster Orientation

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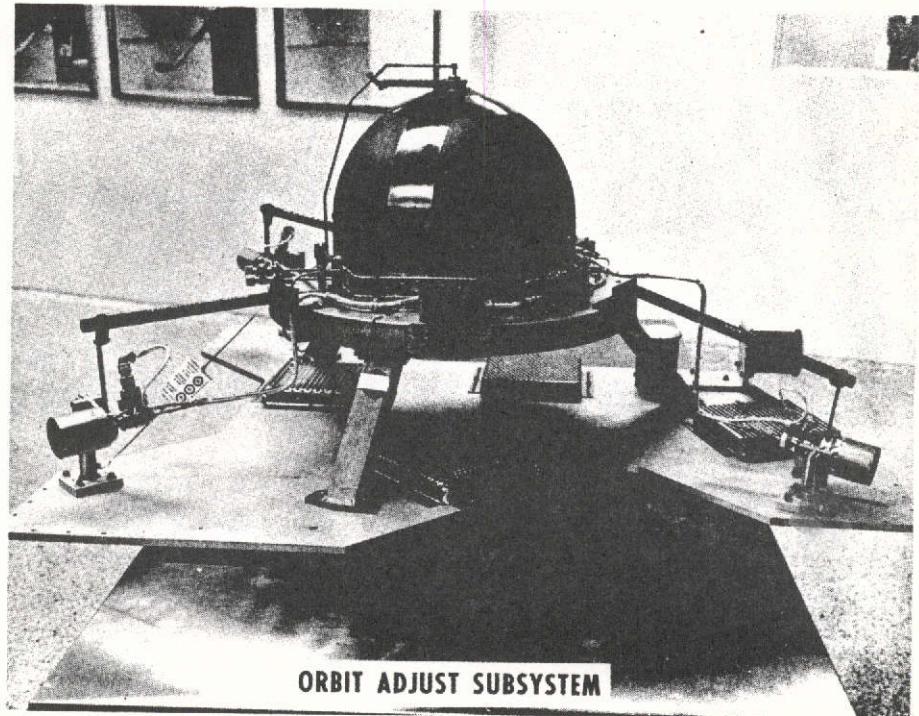
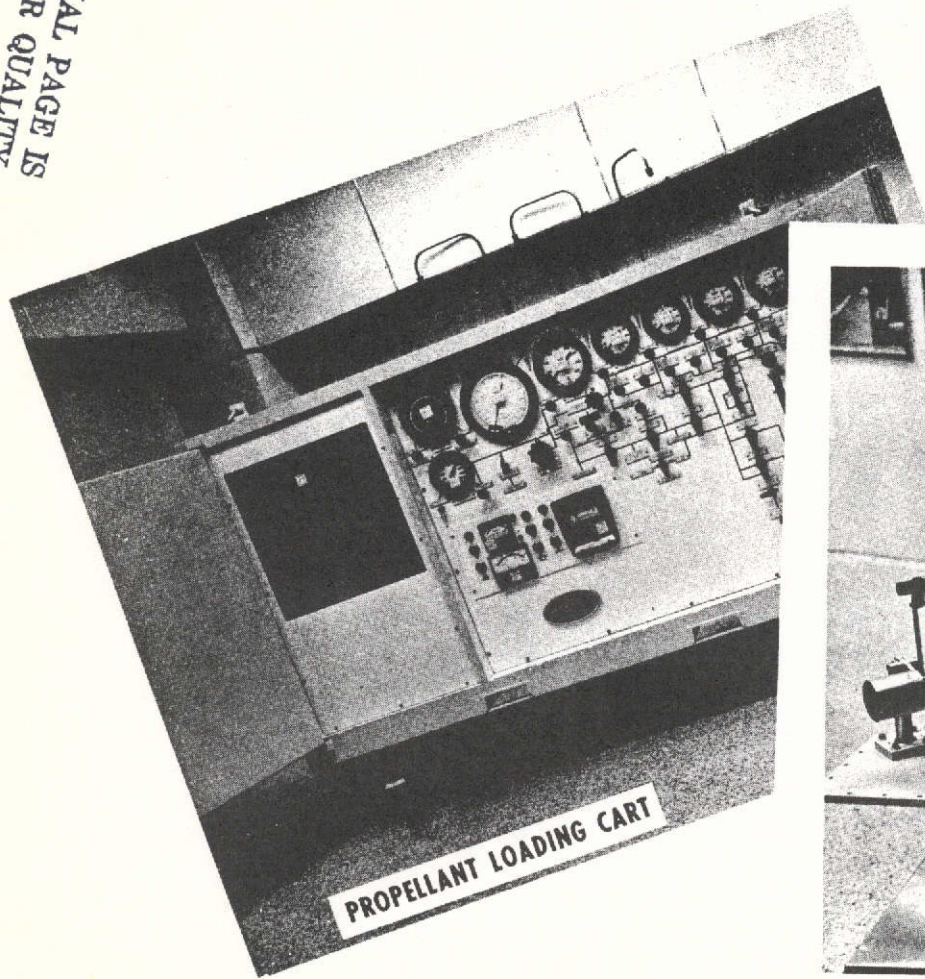
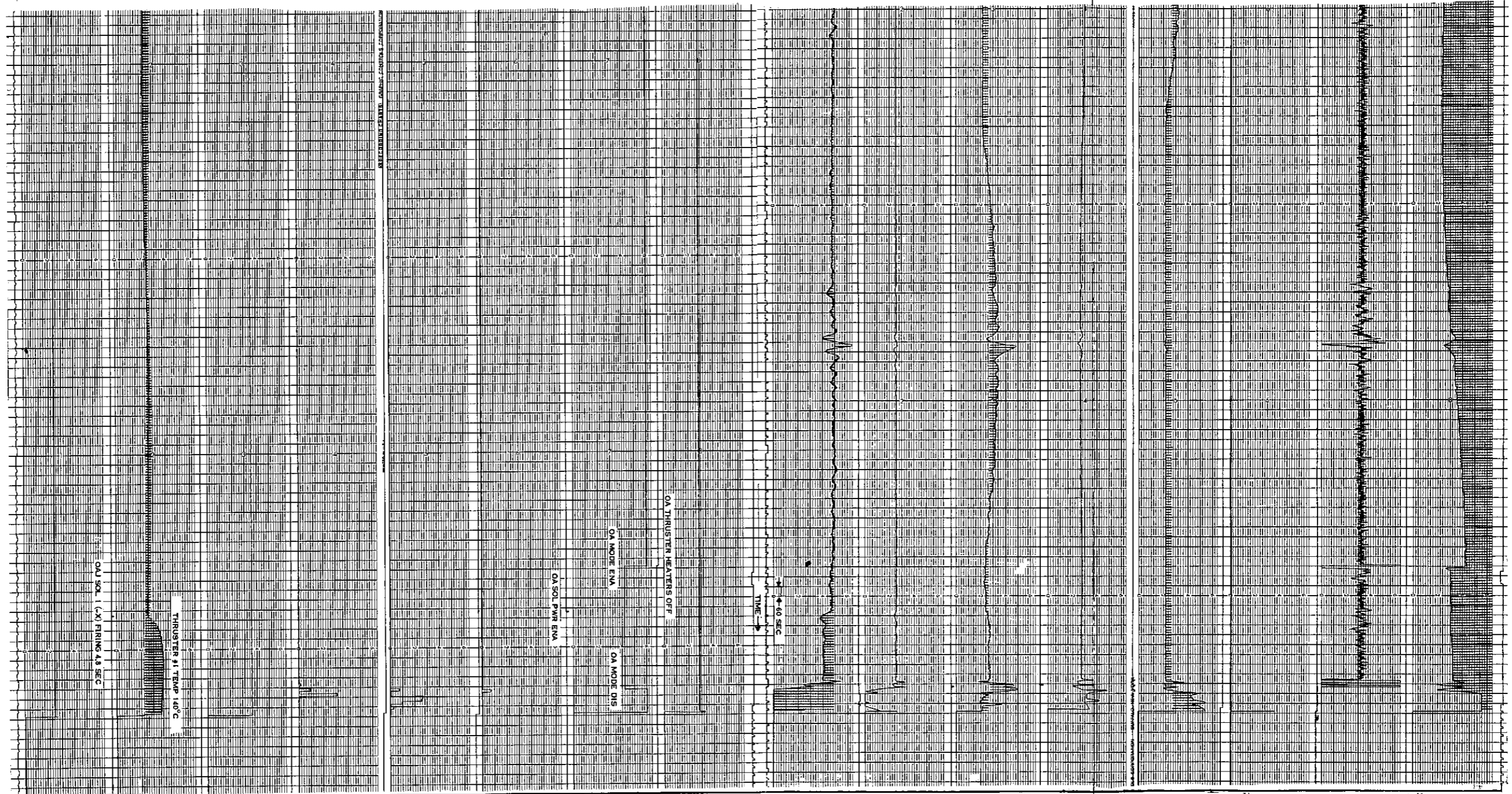


Figure 9-3. Orbit Adjust Subsystem



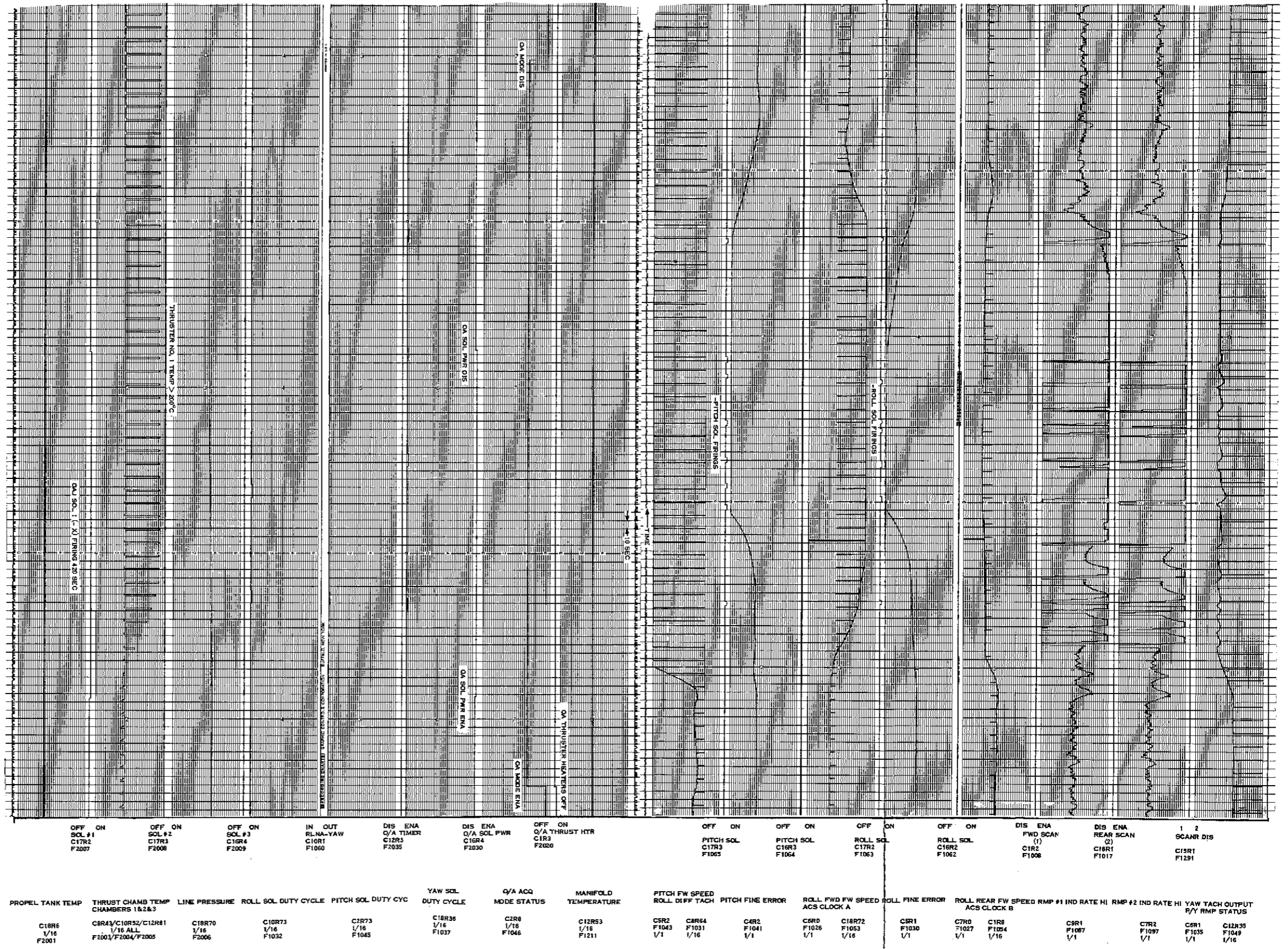
|  |   |  |  |  |  |   |  |  |                                      |                                      |   |   |                                    |   |                                      |                      |                      |                      |                         |
|--|---|--|--|--|--|---|--|--|--------------------------------------|--------------------------------------|---|---|------------------------------------|---|--------------------------------------|----------------------|----------------------|----------------------|-------------------------|
| OFF ON<br>SOL #1<br>C17R2<br>F2007         | OFF ON<br>SOL #2<br>C17R3<br>F2008  | OFF ON<br>SOL #3<br>C16R4<br>F2009       | IN OUT<br>RLNA-YAW<br>C10R1<br>F1060           | DIS ENA<br>O/A TIMER<br>C12R3<br>F2035       | DIS ENA<br>O/A SOL PWR<br>C18R4<br>F2030         | OFF ON<br>O/A THRUST HTR<br>C1R3<br>F2020       | OFF ON<br>PITCH SOL<br>C17R3<br>F1065              | OFF ON<br>PITCH SOL<br>C16R3<br>F1064                    | OFF ON<br>ROLL SOL<br>C17R2<br>F1063 | OFF ON<br>ROLL SOL<br>C16R2<br>F1062 | DIS ENA<br>FWD SCAN<br>(1)<br>C1R2<br>F1008 | DIS ENA<br>REAR SCAN<br>(2)<br>C18R1<br>F1017 | 1 2<br>SCANR DIS<br>C15R1<br>F1291 |   |                                      |                      |                      |                      |                         |
| PROPEL TANK TEMP<br>C18R6<br>1/16<br>F2001 | THRUST CHAMB TEMP<br>CHAMBERS 1&2&3<br>C8R43/C10R52/C12R61<br>1/16 ALL<br>F2003/F2004/F2005 | LINE PRESSURE<br>C18R70<br>1/16<br>F2006 | ROLL SOL DUTY CYCLE<br>C10R73<br>1/16<br>F1032 | PITCH SOL DUTY CYC<br>C2R73<br>1/16<br>F1045 | YAW SOL<br>DUTY CYCLE<br>C18R36<br>1/16<br>F1037 | O/A ACQ<br>MODE STATUS<br>C2R8<br>1/16<br>F1046 | MANIFOLD<br>TEMPERATURE<br>C12R53<br>1/16<br>F1211 | PITCH FW SPEED<br>ROLL DIFF TACH<br>C5R2<br>F1043<br>1/1 | C8R64<br>F1031<br>1/16               | C4R2<br>F1041<br>1/1                 | C6R0<br>F1026<br>1/1                        | C18R72<br>F1053<br>1/16                       | C5R1<br>F1030<br>1/1               | ROLL REAR FW SPEED RMP #1 IND RATE HI<br>C7R0<br>F1027<br>1/1 | ACS CLOCK B<br>C1R8<br>F1054<br>1/16 | C9R1<br>F1087<br>1/1 | C7R2<br>F1097<br>1/1 | C6R1<br>F1035<br>1/1 | C12R35<br>F1049<br>1/16 |

Figure 9-4. Performance Characteristics

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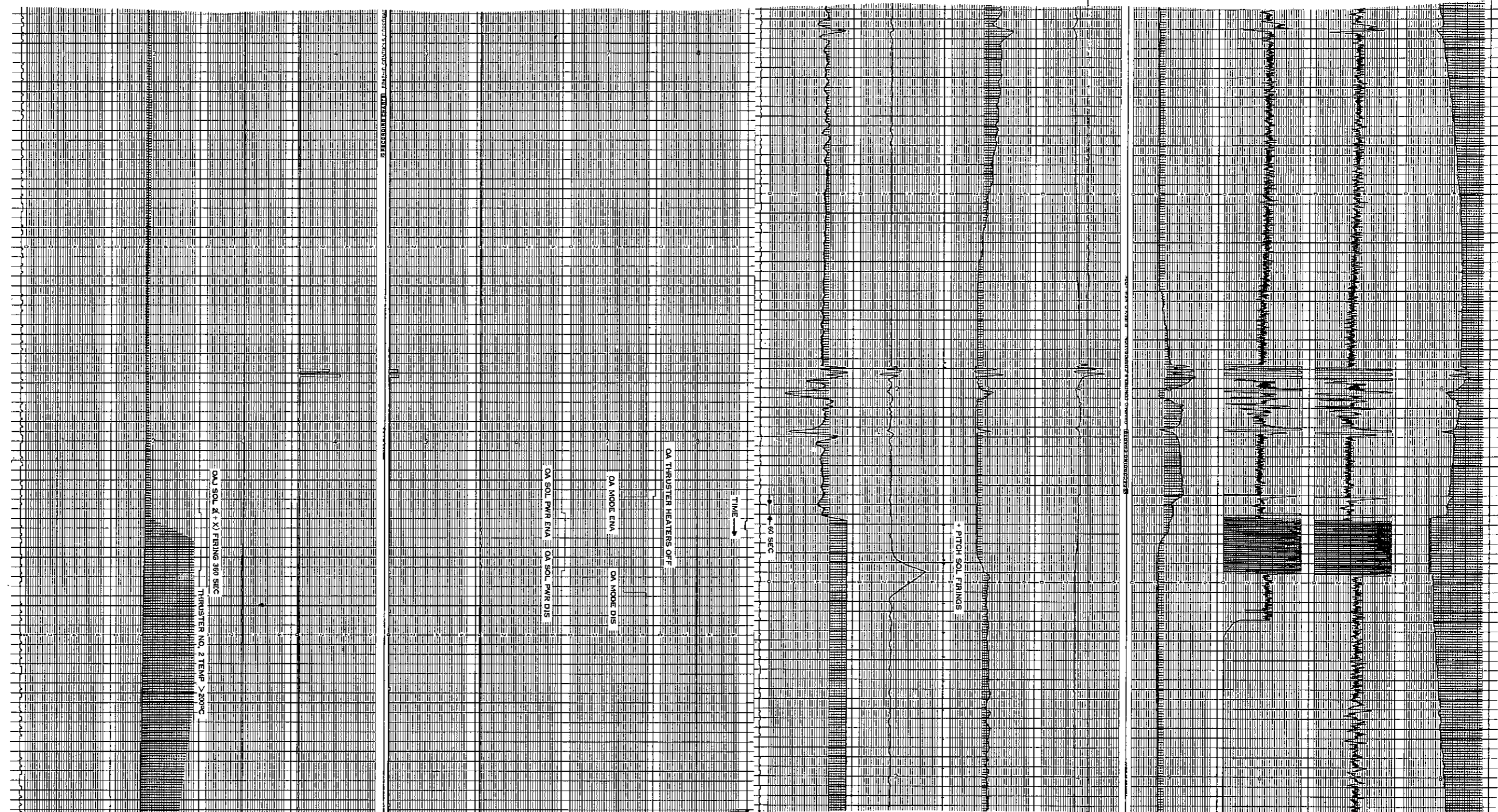
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Figure 9-5. Performance Characteristics

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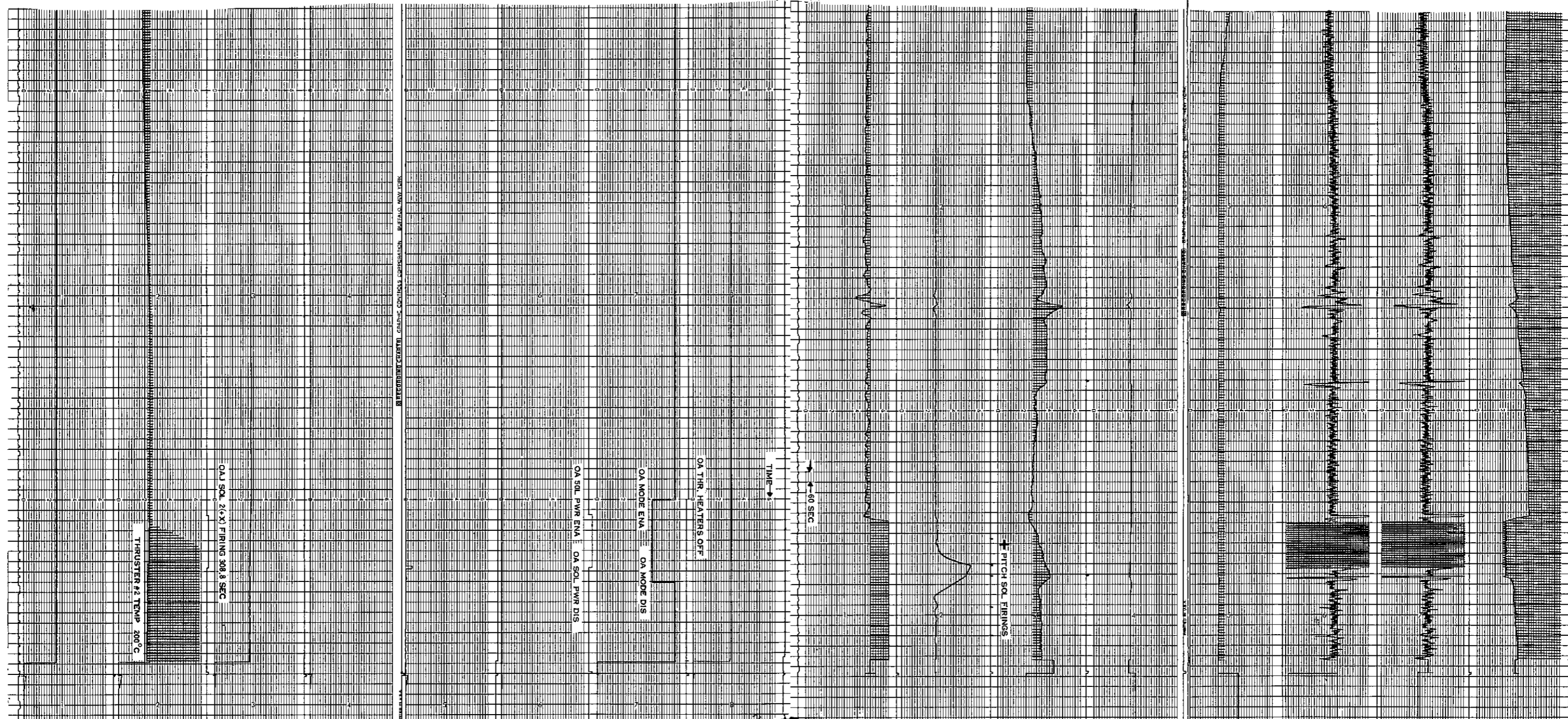
|  |   |  |  |  |  |   |  |  |                                       |                                      |                                      |   |   |   |                                      |                      |                      |                      |  |
|--|---|--|--|--|--|---|--|--|---------------------------------------|--------------------------------------|--------------------------------------|---|---|---|--------------------------------------|----------------------|----------------------|----------------------|--|
| OFF SOL #1<br>C17R2<br>F2007               | ON SOL #2<br>C17R3<br>F2008   | OFF SOL #3<br>C16R4<br>F2009             | ON SOL #4<br>C16R4<br>F2009                    | IN OUT<br>RLNA-YAW<br>C10R1<br>F1060         | DIS ENA<br>O/A TIMER<br>C12R3<br>F2035           | DIS ENA<br>O/A SOL PWR<br>C16R4<br>F2030        | OFF ON<br>O/A THRUST HTR<br>C1R3<br>F2020          | OFF ON<br>PITCH SOL<br>C17R3<br>F1065                    | OFF ON<br>PITCH SOL<br>C16R3<br>F1064 | OFF ON<br>ROLL SOL<br>C17R2<br>F1063 | OFF ON<br>ROLL SOL<br>C16R2<br>F1062 | DIS ENA<br>FWD SCAN<br>(1)<br>C1R2<br>F1008 | DIS ENA<br>REAR SCAN<br>(2)<br>C18R1<br>F1017 | 1 2<br>SCANR DIS<br>C15R1<br>F1291                            |                                      |                      |                      |                      |  |
| PROPEL TANK TEMP<br>C18R6<br>1/16<br>F2001 | THRUST CHAMB TEMP<br>CHAMBERS 1&2&3<br>C8R43/C10R52/C12R61<br>1/16 ALL<br>F2003/F2004/F2005 | LINE PRESSURE<br>C18R70<br>1/16<br>F2006 | ROLL SOL DUTY CYCLE<br>C10R73<br>1/16<br>F1032 | PITCH SOL DUTY CYC<br>C2R73<br>1/16<br>F1045 | YAW SOL<br>DUTY CYCLE<br>C18R36<br>1/16<br>F1037 | Q/A ACC<br>MODE STATUS<br>C2R8<br>1/16<br>F1046 | MANIFOLD<br>TEMPERATURE<br>C12R53<br>1/16<br>F1211 | PITCH FW SPEED<br>ROLL DIFF TACH<br>C8R2<br>F1043<br>1/1 | C8R64<br>F1031<br>1/16                | C4R2<br>F1041<br>1/1                 | C6R0<br>F1028<br>1/1                 | C18R72<br>F1053<br>1/16                     | CSR1<br>F1030<br>1/1                          | ROLL REAR FW SPEED RMP #1 IND RATE HI<br>C7R0<br>F1027<br>1/1 | ACS CLOCK B<br>C1R8<br>F1034<br>1/16 | CSR1<br>F1087<br>1/1 | C7R2<br>F1097<br>1/1 | C8R1<br>F1035<br>1/1 | YAW TACH OUTPUT<br>P/Y RMP STATUS<br>C12R35<br>F1049<br>1/16 |

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Figure 9-6. Performance Characteristics

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|  |   |  |  |  |  |   |  |  |                                      |                                      |  |   |                                    |   |                       |                      |                      |                      |                         |
|--|---|--|--|--|--|---|--|--|--------------------------------------|--------------------------------------|--|---|------------------------------------|---|-----------------------|----------------------|----------------------|----------------------|-------------------------|
| OFF ON<br>SOL #1<br>C17R2<br>F2007         | OFF ON<br>SOL #2<br>C17R3<br>F2008  | OFF ON<br>SOL #3<br>C16R4<br>F2009       | IN OUT<br>RLNA-YAW<br>C10R1<br>F1060           | DIS ENA<br>O/A TIMER<br>C12R3<br>F2035       | DIS ENA<br>O/A SOL PWR<br>C16R4<br>F2039         | OFF ON<br>O/A THRUST HTR<br>C1R3<br>F2020       | OFF ON<br>PITCH SOL<br>C17R3<br>F1065              | OFF ON<br>PITCH SOL<br>C16R3<br>F1064                    | OFF ON<br>ROLL SOL<br>C17R2<br>F1063 | OFF ON<br>ROLL SOL<br>C16R2<br>F1062 | DIS ENA<br>FWD SCAN<br>(1)<br>C1R2<br>F1008              | DIS ENA<br>REAR SCAN<br>(2)<br>C18R1<br>F1017 | 1 2<br>SCANR DIS<br>C15R1<br>F1291 |   |                       |                      |                      |                      |                         |
| PROPEL TANK TEMP<br>C18R6<br>1/16<br>F2001 | THRUST CHAMB TEMP<br>CHAMBERS 1&2&3<br>C8R43/C10R52/C12R61<br>1/16 ALL<br>F2003/F2004/F2005 | LINE PRESSURE<br>C18R70<br>1/16<br>F2006 | ROLL SOL DUTY CYCLE<br>C10R73<br>1/16<br>F1032 | PITCH SOL DUTY CYC<br>C2R73<br>1/16<br>F1045 | YAW SOL<br>DUTY CYCLE<br>C18R36<br>1/16<br>F1037 | Q/A ACQ<br>MODE STATUS<br>C2R8<br>1/16<br>F1046 | MANIFOLD<br>TEMPERATURE<br>C12R53<br>1/16<br>F1211 | PITCH FW SPEED<br>ROLL DIFF TACH<br>CSR2<br>F1043<br>1/1 | C8R64<br>F1031<br>1/16               | C4R2<br>F1041<br>1/1                 | ROLL FWD FW SPEED<br>ACS CLOCK A<br>C6R0<br>F1025<br>1/1 | C18R72<br>F1053<br>1/16                       | CSR1<br>F1030<br>1/1               | ROLL REAR FW SPEED<br>ACS CLOCK B<br>C7R0<br>F1027<br>1/1 | C1R8<br>F1054<br>1/16 | C8R1<br>F1087<br>1/1 | C7R2<br>F1097<br>1/1 | C6R1<br>F1035<br>1/1 | C12R35<br>F1049<br>1/16 |

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Figure 9-7. Performance Characteristics

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**SECTION 10**  
**MAGNETIC MOMENT COMPENSATING**  
**ASSEMBLY (MMCA)**



SECTION 10  
MAGNETIC MOMENT COMPENSATING  
ASSEMBLY (MMCA)

The purpose of the MMCA is to provide means for generating magnetic dipole moments sufficient to cancel those residual dipole moments that may exist on the spacecraft. The MMCA consists of three mutually perpendicular, chargeable, permanent magnetic rods. Activation of the charging and discharging mechanism is by commands. See Figure 10-1 for functional block diagram.

The MMCA was launched in the OFF mode as noted in Table 10-1.

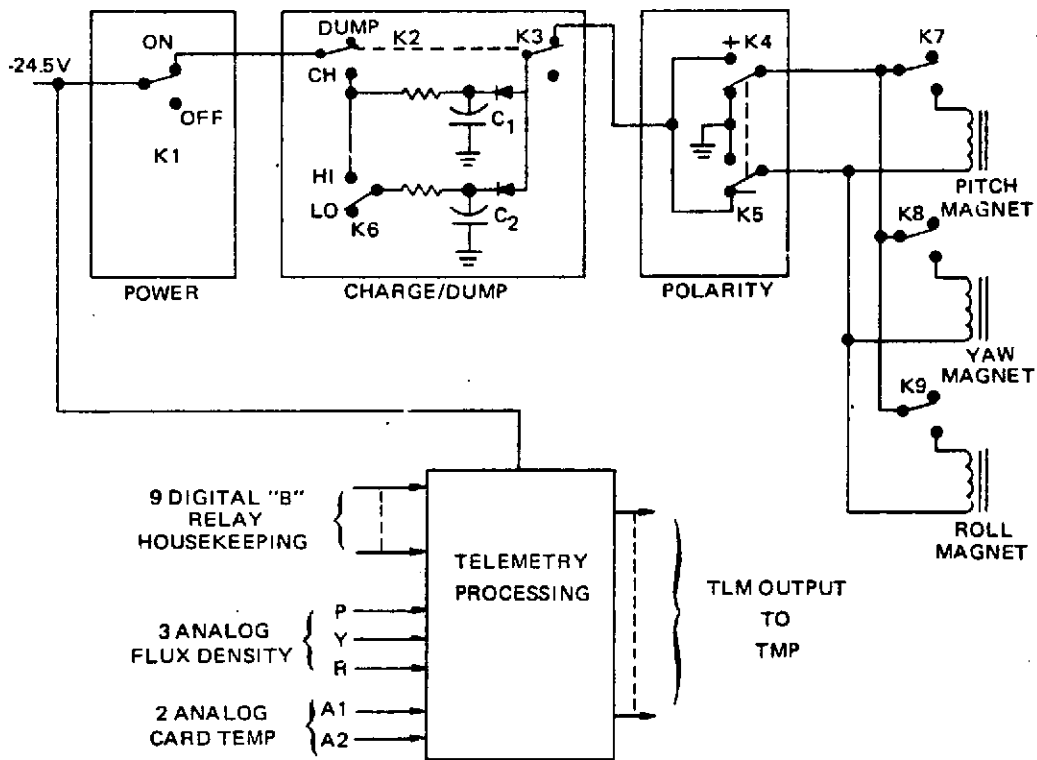


Figure 10-1. MMCA Functional Block Diagram

Table 10-1. MMCA Launch Mode

|            | MODE | CMD |
|------------|------|-----|
| POWER      | OFF  | 765 |
| CAPACITOR  | HI   | 744 |
| CAPACITOR  | DUMP | 706 |
| POLARITY   | +    | 742 |
| PITCH COIL | OUT  | 702 |
| ROLL COIL  | OUT  | 761 |
| YAW COIL   | OUT  | 704 |

Housekeeping functions of the MMCA were normal. The unit was not activated; insertion of dipole values was deferred pending evaluation of the ACS performance. Gating during orbits in this period has averaged 0.8 gates in the +R, 0.1 gates in the -R, and 0.5 gates in the +P direction per orbit. Table 10-2 gives average telemetry values.

Table 10-2. MMCA Telemetry Values

| Number | Name               | Units | Orbit<br>0-1 | T/V           |             |
|--------|--------------------|-------|--------------|---------------|-------------|
|        |                    |       |              | 20°C Plateau* | Orbit<br>50 |
| 4001   | A1 Board Temp      | °C    | 21.54        | 21.3          | 20.56       |
| 4002   | A2 Board Temp      | °C    | **           | 20.6          | **          |
| 4003   | Hall Current       | TMV   | 3.40         | 3.40          | 3.40        |
| 4004   | Yaw Flux Density   | TMV   | 3.05         | 3.00          | 3.05        |
| 4005   | Pitch Flux Density | TMV   | 3.12         | 3.20          | 3.15        |
| 4006   | Roll Flux Density  | TMV   | 2.99         | 3.00          | 2.99        |

\*Thermal Vacuum Test Data

\*\*Defective Telemetry Function

SECTION 11  
UNIFIED S-BAND/PREMODULATION  
PROCESSOR (USB/PMP)

SECTION 11  
UNIFIED S-BAND/PREMODULATION  
PROCESSOR (USB/PMP)

The Unified S-Band Equipment (USBE) consists of two S-Band transmitter/receiver pairs (transponders). Each transmitter/receiver pair normally operates as a separate unit. Only one of the two is powered at any given time, but it is possible to cross-strap them by ground command. When cross-strapped, the receiver of one transponder and the transmitter of the other are powered. The USB Receiver receives the uplink RF signal, demodulates the command and ranging subcarriers, and, when possible, provides a phase-locked oscillator signal for the down-link USB transmitter. A ranging (psuedo-random noise-PRN) signal is demodulated and is available for modulation of the downlink upon ground command. The subcarrier containing command information is sent to the PMP. One of the USB receivers is powered at all times. The USB transmitter uses either the phase-locked oscillator of the USB receiver or, if sufficient signal for phase-lock is not present, an auxiliary oscillator for the transmitter RF driver. Back-up modes allow and sometimes require use of the auxiliary oscillator or the receiver oscillator (phase-locked or free-running) at all times. Modulation of the USB transmitter comes from the PMP, and may or may not have the PRN ranging signal added. Switching permits either transmitter to be ON or OFF, but both transmitters ON simultaneously is not possible. Protection against inadvertent leaving ON of either transmitter (and/or either of the wide band power amplifiers) is provided by a 32 minute cutoff timer. See Figure 11-1 for Functional Block diagram. Figures 11-2 and 11-3 are modulation formats.

The USBE was launched in the OFF mode, as noted in Table 11-1, and activated after separation in Orbit 0 near Tananarive. Commands were successfully uplinked in orbit 1 at Madrid and have continued to be normal since that time. Table 11-2 gives average telemetry values. Table 11-3 gives prelaunch measured data.

At launch, the operational mode was MSFN A/STADAN B, which employs USB-A section for both receiver and transmitter. In orbit 45, the operational mode was changed to MSFN

B/STADAN A at 23:08:13 on 25 January. This mode employs the B section of the USB. A comparison of the two telemetry readings can be seen in Table 11-2.

Table 11-1. USB/PMP Launch Mode

|              | Mode | CMD |
|--------------|------|-----|
| USB XMTR PWR | EN   | 347 |
| USB XMTR     | DIS  | 757 |
| AUX OSC      | EN   | 150 |
| SEL XMTR     | A    | 126 |
| RANGING      | OFF  | 146 |
| MOD INPUT    | NORM | 147 |

Table 11-2. USB/PMP Telemetry Values

| Function No. | Function Name         | Mode                  | Units | Orbit 15 | T/V* Average Value 20° Plateau | Orbit 50 |
|--------------|-----------------------|-----------------------|-------|----------|--------------------------------|----------|
| 11001        | USB Receiver AGC      | Receiver A Low        | DBM   | -112.72  | NA                             | -120.24  |
| 11002        | USB Transmitter Power | Transmitter A ON      | WTS   | 1.36     | 1.40                           | 1.36     |
| 11003        | Receiver Error        | Receiver A Normal     | KHz   | -2.15    | NA                             | -4.87    |
| 11004        | USB Transponder Temp. | Transponder ON        | °C    | 25.88    | 22.33                          | 29.12    |
| 11005        | USB Transponder Pres. | Transponder ON        | PSI   | 17.08    | 16.99                          | 17.09    |
| 11007        | USB Transmitter A-15V | Transmitter A ON      | VDC   | 2.36     | 2.35                           | OFF      |
| 11008        | USB Transmitter B-15V | Transmitter B ON      | VDC   | OFF      | 2.39                           | 2.40     |
| 11009        | USB Ranging Mode-15-V | Ranging ON Disc. A ON | VDC   | 2.07     | 2.07                           | 2.05     |
| 11101        | PMP A Voltage         | Discrim. A ON         | VDC   | -15.10   | -15.22                         | OFF      |
| 11102        | PMP B Voltage         | Discrim. B ON         | VDC   | OFF      | -15.07                         | -14.96   |
| 11103        | PMP A Temp.           | TLM Power ON          | °C    | 37.30    | NA                             | 32.37    |
| 11104        | PMP B Temp.           | TLM Power ON          | °C    | 28.34    | NA                             | 35.16    |

Table 11-3. Unified S-Band Subsystem

| <u>Components</u>                                 |             |                 |              |
|---|-------------|-----------------|--------------|
| USBE  | EAB-QM      |                 |              |
| PMP   | EAB-FT2     |                 |              |
| Pre-Launch Performance                            |             |                 |              |
|   | <u>Spec</u> | <u>Measured</u> |              |
|   |             | <u>A</u>        | <u>B</u>     |
| XMTR RF power output                              | 1W          | 1.20W           | 1.18W        |
| RCVR CMD threshold                                | -95 DBM     | -105 DBM        | -100 DBM     |
| Range delay variation                             | 40 NSEC P-P | 10.9 NSEC P-P   | 5.7 NSEC P-P |
| Pre-Launch Problem Summary                        |             |                 |              |
| No problems throughout environmental test program |             |                 |              |

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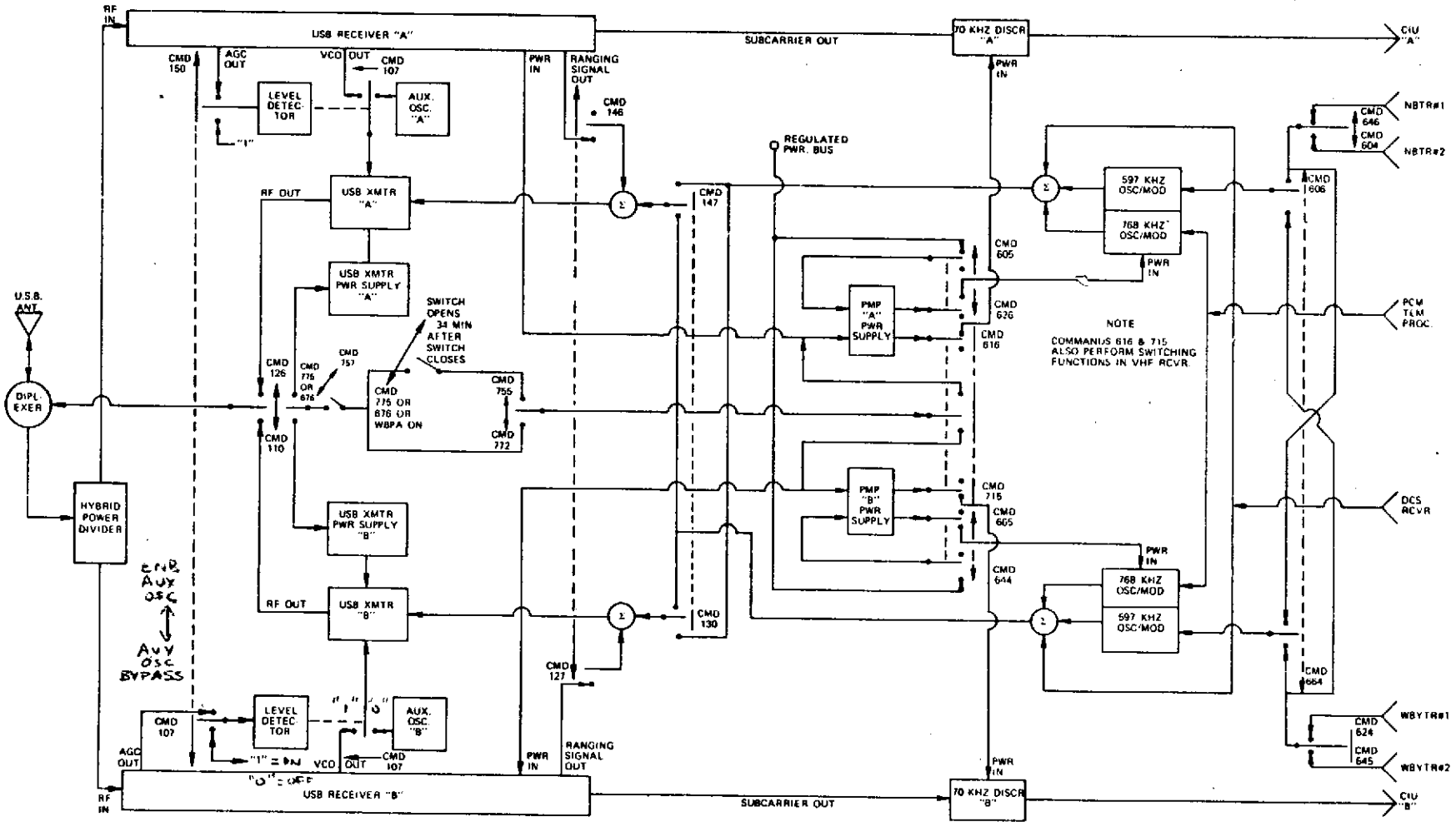


Figure 11-1. USBE/PMP Functional Block Diagram

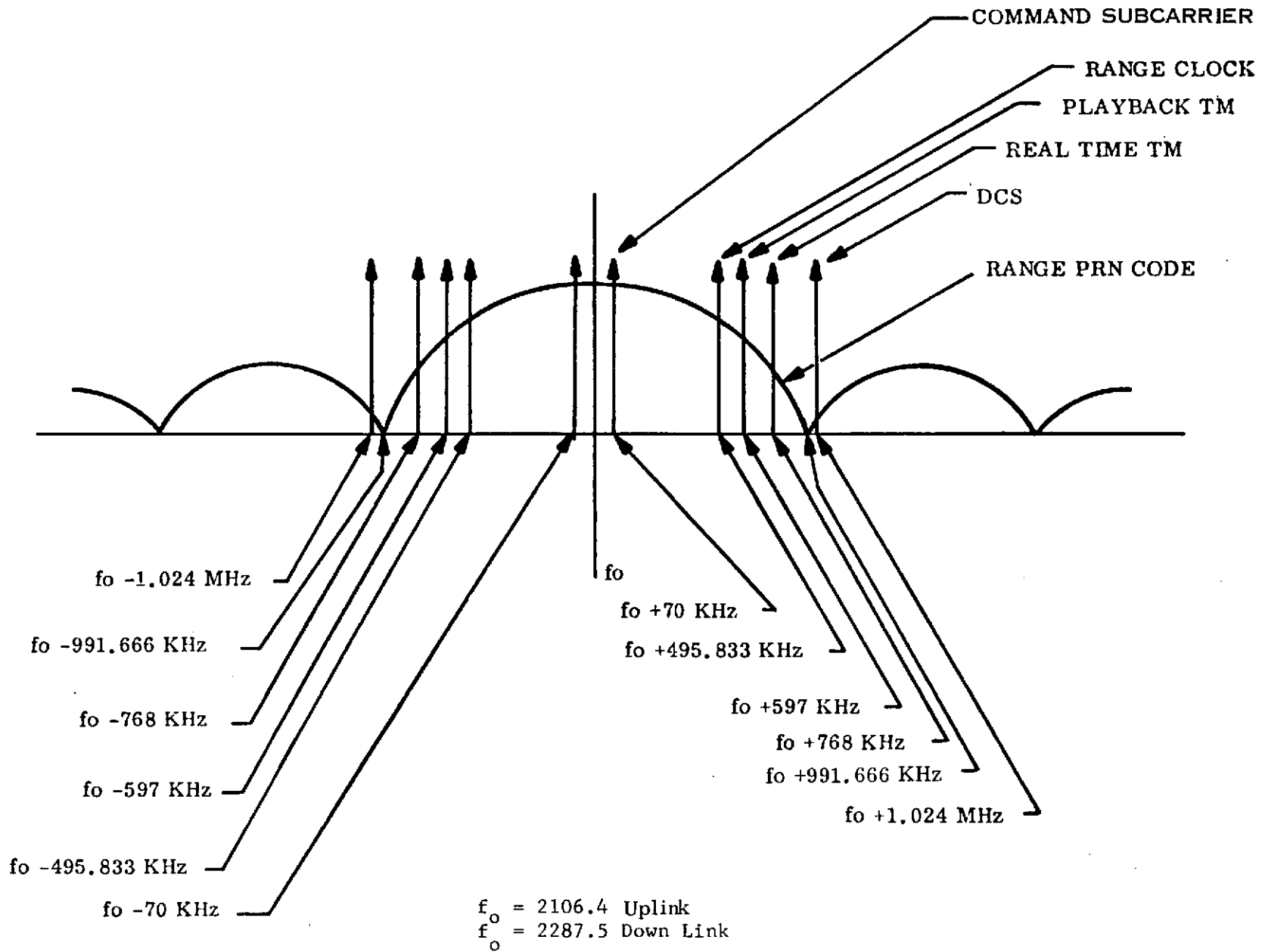


Figure 11-2. S-Band Transmission Spectrum

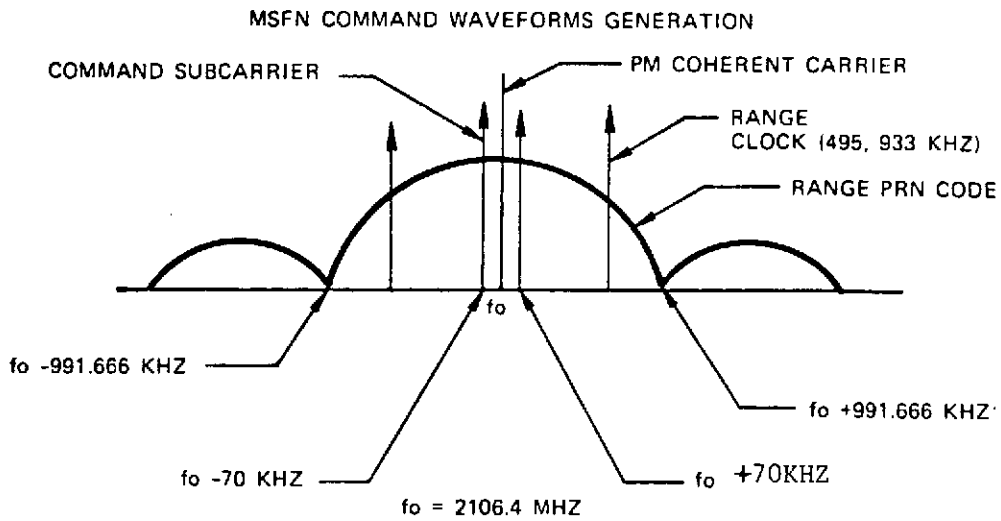
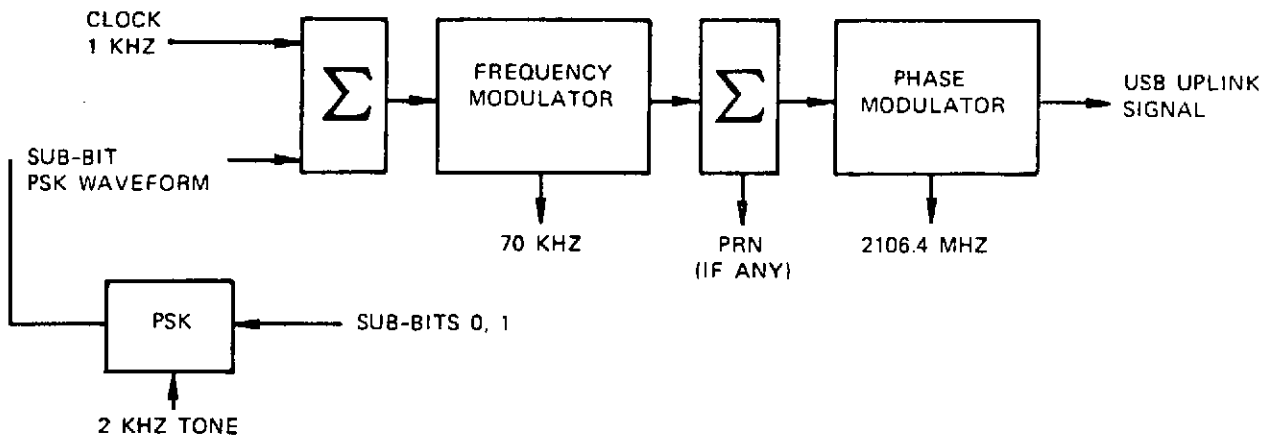
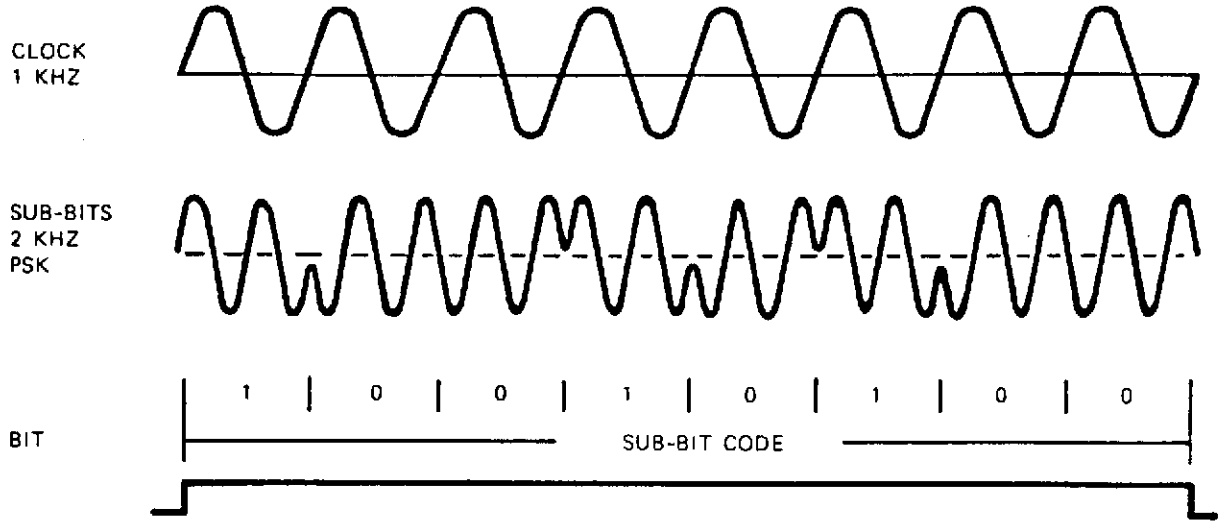


Figure 11-3. MSFN/USB Uplink Modulation

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**SECTION 12**  
**SEPARATION AND UNFOLD SUBSYSTEM**

## SECTION 12

### SEPARATION AND UNFOLD SUBSYSTEM

The Separation and Unfold Subsystem consists of the following components: Unfold Timer, Unfold Switch, Separation Switches, Unfold Motors, and Cable Cutter Assembly. At programmed separation time, the launch vehicle provides power to fire four electro-explosive bolt cutters to effect spacecraft separation. See Figures 12-1 and 12-2 for mechanical arrangement, and Figure 12-3 for Functional Block Diagram.

The separation subsystem performed as expected. The 2.5 second timer caused paddle unfold. Before separation the subsystem properly restrained the paddles, disabled the primary and redundant matrix A drivers, provided -24.5 VDC to the attitude control reset line, and provided telemetry signals indicating that the spacecraft was still mated to the Delta Vehicle. After separation all circuits were activated and separation was confirmed by referring to the strip chart ACS telemetry functions listed below:

| <u>Function No.</u> | <u>Title</u>               | <u>Delta Activation Time From Separation (<math>\Delta</math> Seconds)</u> |
|---------------------|----------------------------|--|
| 1240                | SAD left MTR WNDG voltage  | 52.5   |
| 1220                | SAD right MTR WNDG voltage | 52.5   |
| 1027                | Roll rear flywheel speed   | 17.5   |
| 1035                | Yaw tach output            | 17.5   |
| 1040                | Pitch coarse error         | 17.5   |
| 1043                | Pitch flywheel speed       | 17.5   |

All of these functions have known activation delta times from separation, and all are read each second in the telemetry matrix.

By measuring the delta times backwards, i. e., from activation to separation, all of the functions indeed commence from the same baseline in time, and hence confirm the separation time.

It was necessary to employ this technique because the separation switch functions normally used to monitor separation were removed from the software programs.

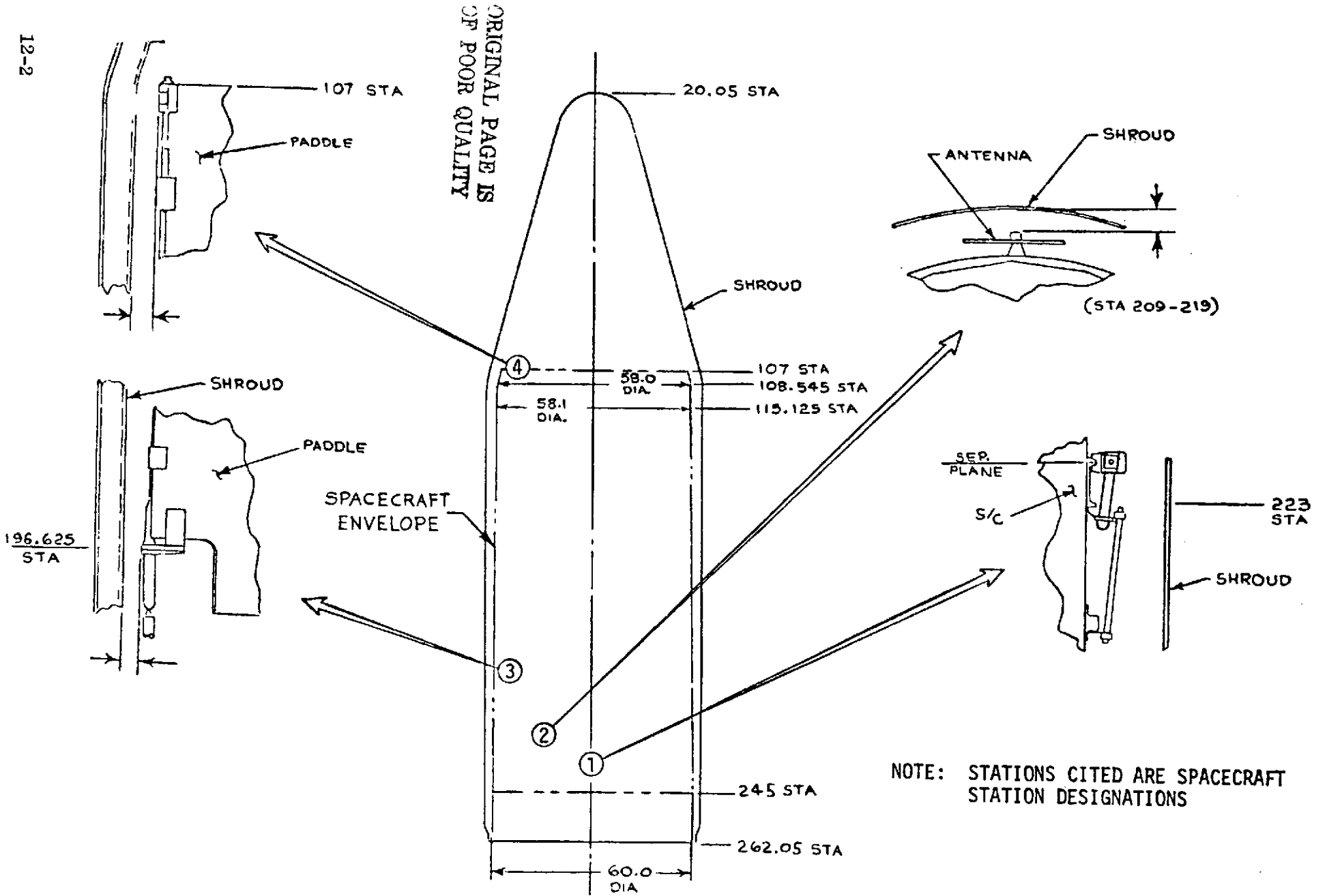


Figure 12-1. ERTS Observatory/Shroud Envelope and Minimum Clearances

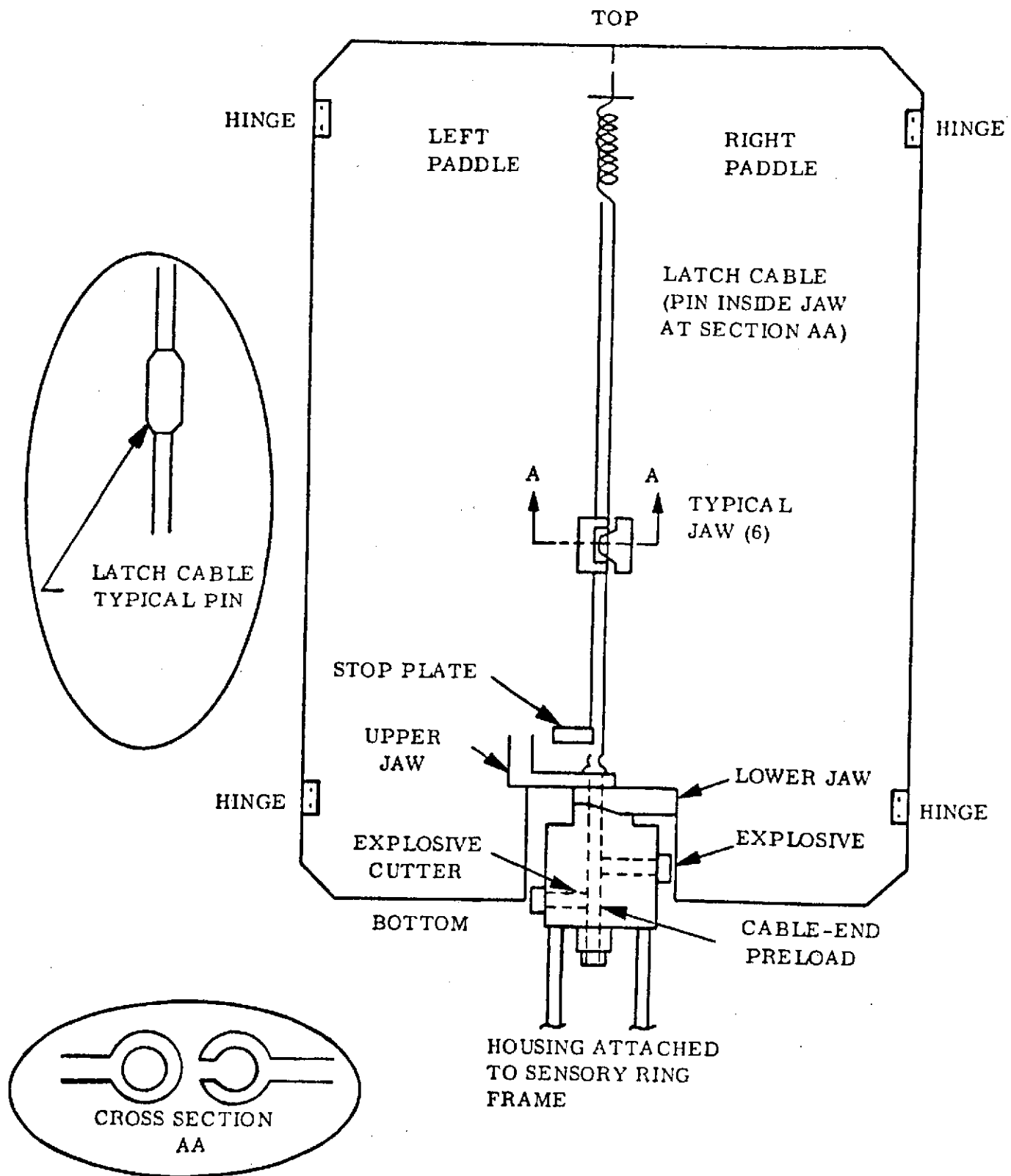
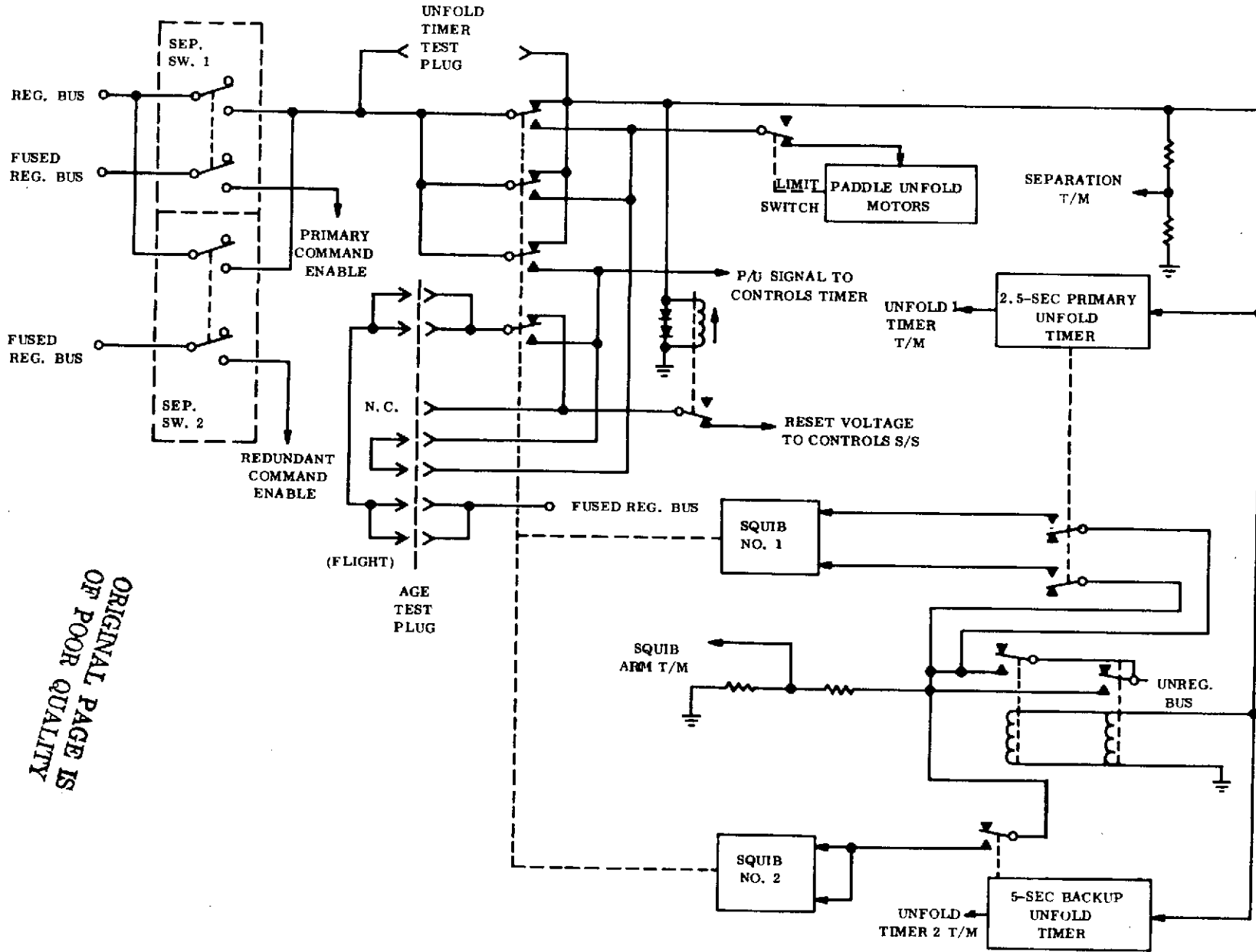


Figure 12-2. Separation and Unfold Subsystem Mechanical Details



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Figure 12-3. Separation and Unfold Subsystem Functional Block Diagram

**SECTION 13**  
**ELECTRICAL INTERFACE SUBSYSTEM**

SECTION 13  
ELECTRICAL INTERFACE SUBSYSTEM

The EIS is a collection of three modules: The Auxiliary Processor Unit (APU) (See Figure 13-1 for functional block diagram); The Power Switching Module (PSM) (See Figure 13-2 for functional block diagram) and the Interface Switching Module (ISM). Together they perform a variety of electrical interfacing functions including: power switching, telemetry signal generation, switching logic, power fusing, signal switching (Data) time code processing, automatic "shut-off" timers.

The EIS contains a variety of telemetry points all of which are associated with other subsystems and have been discussed in those sections.

The Launch mode of the APU is given in Table 13-1.

Table 13-1. APU Launch Mode

|              | Mode | Cmd |
|--------------|------|-----|
| POWER        | ON   | 656 |
| MOD          | STBY | 050 |
| P/L TIMER    | DIS  | 720 |
| SEARCH TRACK | NORM | 631 |
| USB/WPA TIM  | EN   | 755 |

All EIS functions which were exercised during launch and activation were executed and confirmed. After launch power switching was held to a minimum. Operation of time code processing, search track data processing, back-up timer operation, signal switching and power switching was confirmed as commands were executed.

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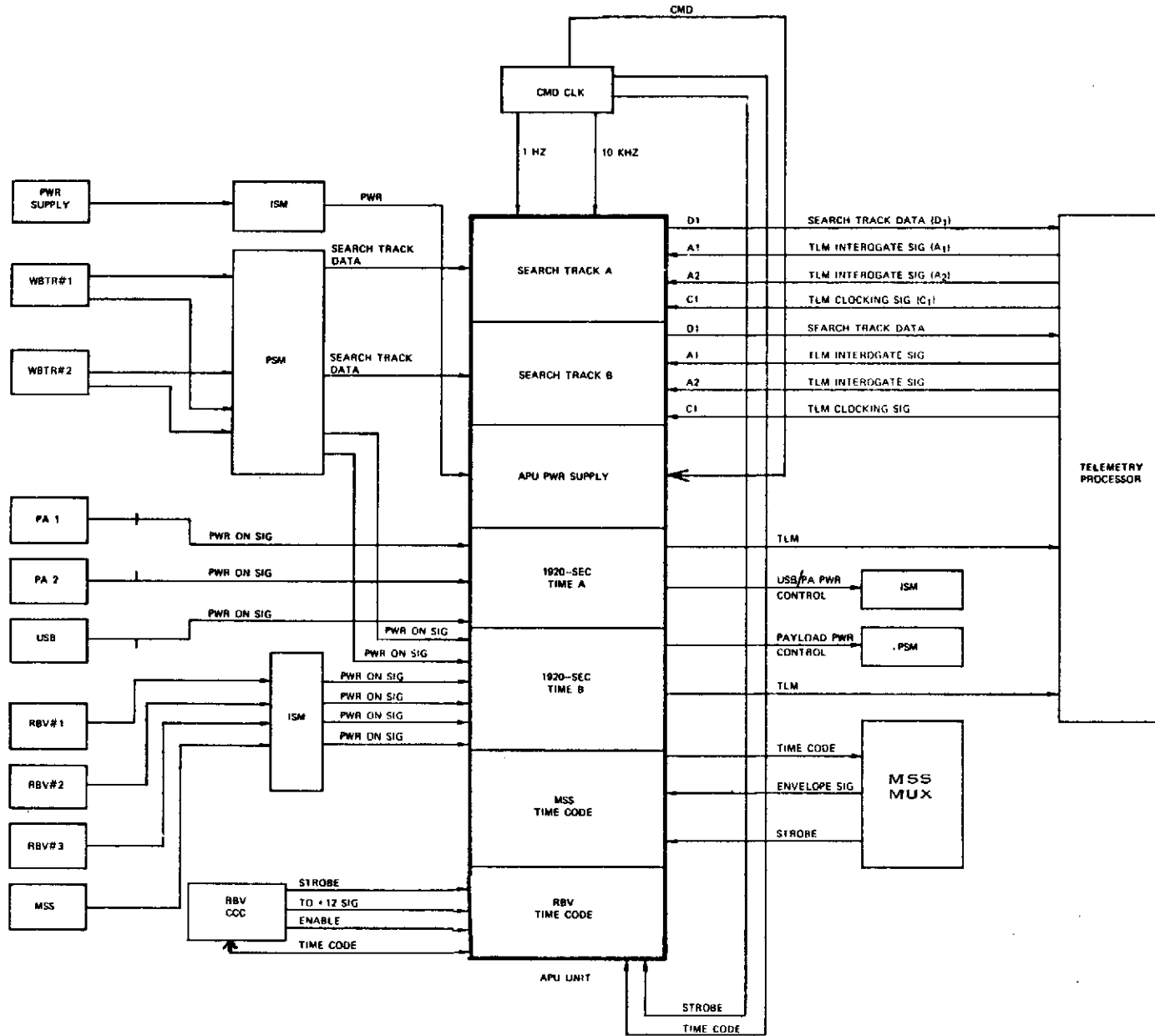


Figure 13-1. APU Functional Block Diagram



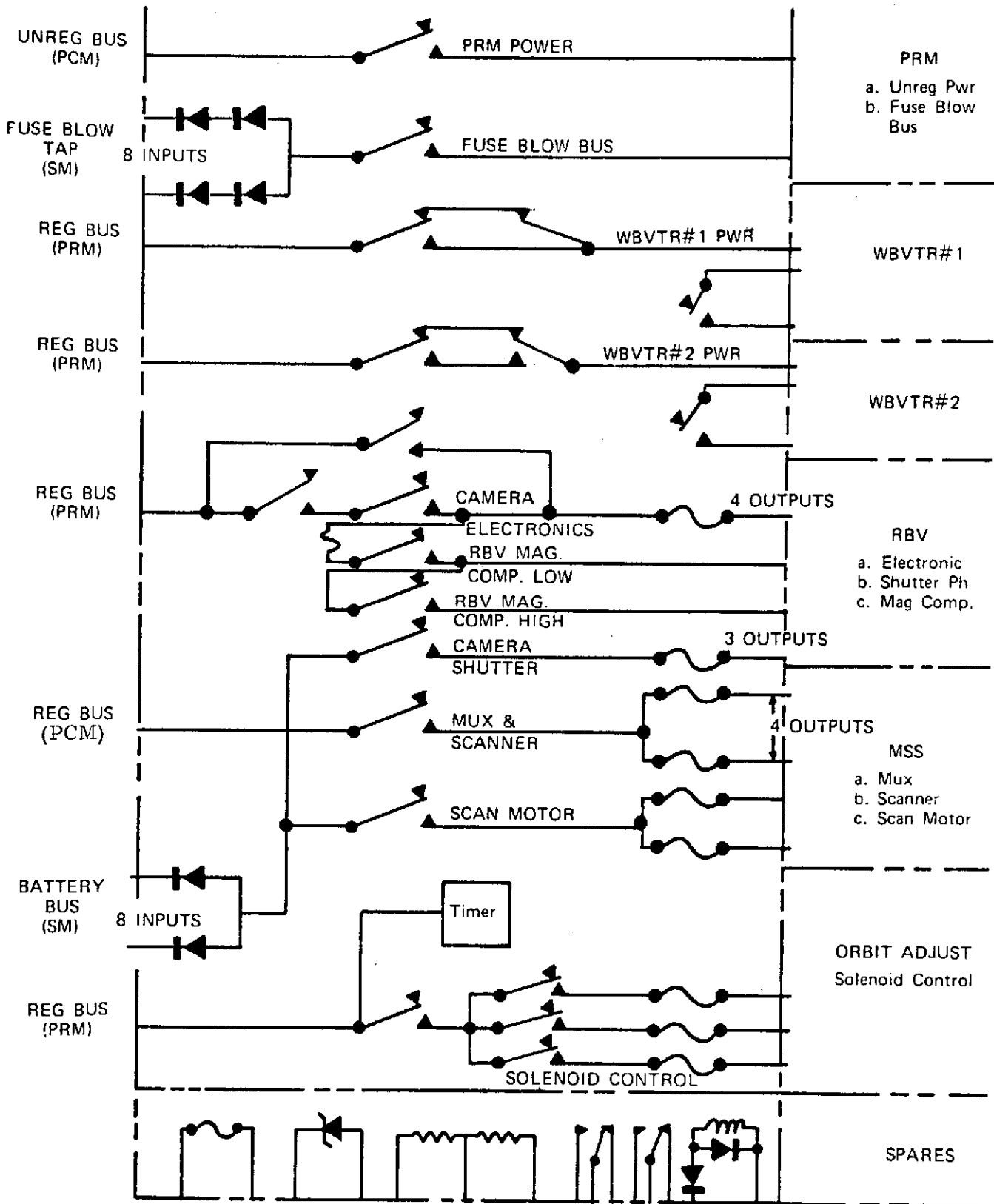


Figure 13-2. PSM Functional Block Diagram

SECTION 14  
THERMAL CONTROL SUBSYSTEM

SECTION 14  
THERMAL CONTROL SUBSYSTEM

Thermal control of the spacecraft is required in order to provide a mounting surface temperature of  $20^{\circ} \pm 10^{\circ}\text{C}$  for all equipment mounting internal to the spacecraft. The LANDSAT-2 spacecraft is composed of three separate elements; the solar arrays, the Attitude Control Subsystem and the sensory ring. These elements are thermally decoupled such that the environment for mission support and payload equipment is provided by the sensory ring Thermal Control Subsystem. The subsystem is composed of both semipassive and passive elements. The semipassive elements are shutters and heaters. Shutters are located on each of the 18 peripheral compartments and are actuated by two-phase fluid-fill bellows assemblies. The heaters are energized by ground command. Passive control, in the form of insulation and coatings, works in conjunction with the semipassive elements to maintain the thermal balance of the vehicle. Figure 14-1 is a block diagram of the Thermal Control Subsystem.

In LANDSAT-2 the thermal control functions were balanced prior to launch and maintained their balance, within expected tolerances, throughout powered flight and orbital operations.

The thermal subsystem in both the sensory ring and the ACS performed within expected limits at all locations.

Typical average temperatures were: ACS baseplate  $20.5^{\circ}\text{C}$ ; sensory ring  $18.9^{\circ}\text{C}$ ; and center section  $19.3^{\circ}\text{C}$ . The shutter position average at Orbit 50 was  $42.8^{\circ}$ .

Table 14-1 provides typical average telemetry values for the Zener modules obtained during thermal vacuum testing and early flight operations.

In Orbit 2 compensation loads 1, 2, 3, 4, 5, 7 and 8 were turned on as scheduled to provide more even heating of the spacecraft until normal operation began. All compensation loads except 6 remained on thru Orbit 50.

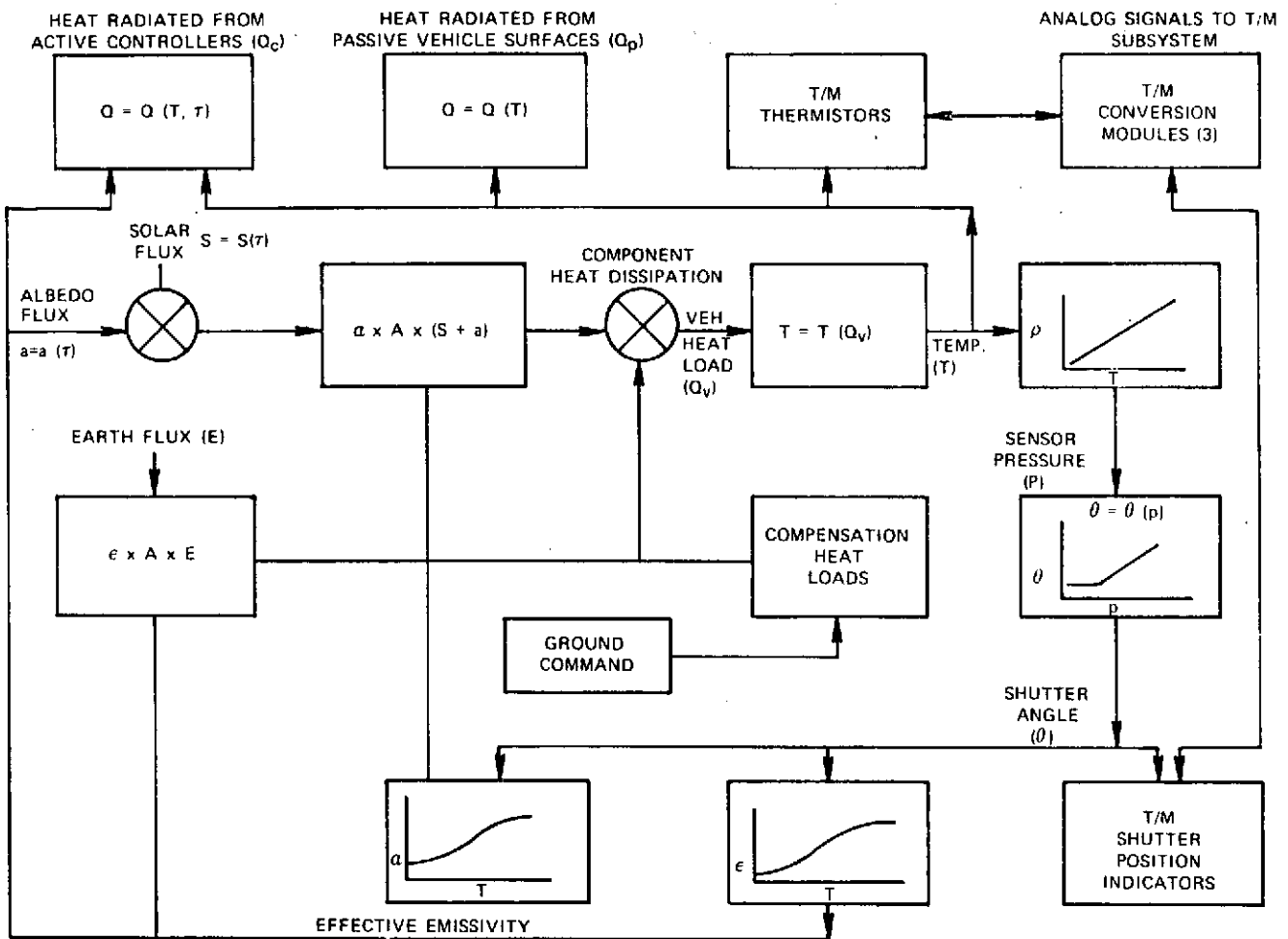


Figure 14-1. Functional Block Diagram of Thermal Control Subsystem

Table 14-1. Thermal Telemetry Values

| Function No. | Function Name                      | Unit | Average Values |                |          |
|--------------|------------------------------------|------|----------------|----------------|----------|
|              |                                    |      | Orbit 0-1      | 25 °C* Plateau | Orbit 50 |
| 7080         | TLM Conv. Mod. Q1 Thermistor Zener | VDC  | 4.85           | 4.85           | 4.86     |
| 7081         | TLM Conv. Mod. Q2 Thermistor Zener | VDC  | 4.88           | 4.90           | 4.90     |
| 7082         | TLM Conv. Mod. Q3 Thermistor Zener | VDC  | 5.02           | 5.03           | 5.05     |
| 7083         | TLM Conv. Mod. Q1 Shutter Zener    | VDC  | 4.95           | 4.95           | 4.97     |
| 7084         | TLM Conv. Mod. Q2 Shutter Zener    | VDC  | 4.96           | 4.96           | 4.99     |
| 7085         | TLM Conv. Mod. Q3 Shutter Zener    | VDC  | 5.14           | 5.15           | 5.17     |

\*Thermal Vacuum Test Data

**SECTION 15**  
**NARROWBAND TAPE RECORDER (NBTR)**

SECTION 15  
NARROWBAND TAPE RECORDER (NBTR)

The NBTR consists of a single-track recording mechanism and the associated electronics necessary for proper amplification and filtering of the RECORD and PLAYBACK signals and for control of the record mechanism. The recorder is completely contained in one box.

The NBTR records 1 KBPS data from the Telemetry Processor, and, upon command, plays back the stored data with simultaneous outputs to the VHF Transmitter and to the Premodulation Processor. The playback speed is 24 times the record speed, and the output data rate is therefore 24 KBPS. The NBTR erases the tape immediately after playback.

The recorder has a capacity for recording 210 minutes of data, and stops automatically when it reaches end-of-tape. Playback is accomplished on command, effecting a reversal in tape direction at 24 times the record rate. Playback can be commanded at any time before the recorder reaches end-of-tape.

The LANDSAT-2 spacecraft contains two Narrowband Tape Recorders, providing a total sequential recording capability of 420 minutes. A simplified block diagram of the Narrowband Tape Recorder is given in Figure 15-1.

The Narrowband Tape Recorders were launched in the record mode as shown in Table 15-1.

The launch mode was verified from telemetry on the CRT display and on the strip charts.

Table 15-1. Narrowband Tape Recorders Launch Mode

|        | MODE | CMD |
|--------|------|-----|
| NBTR 1 | REC  | 543 |
| NBTR 2 | REC  | 601 |

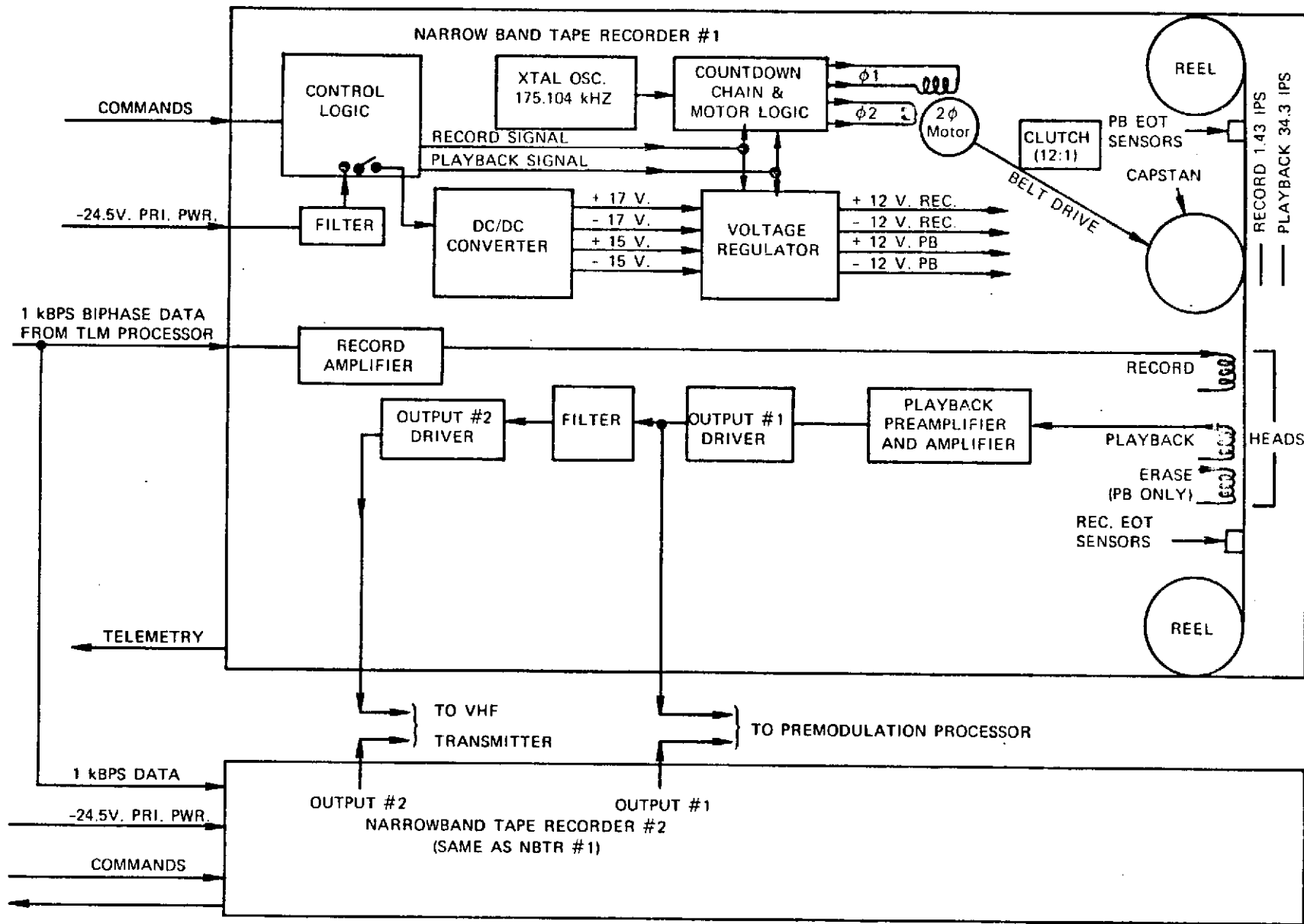


Figure 15-1. Narrowband Tape Recorder Block Diagram

### Initial Turn ON

Prior to launch on January 22, 1975, NBTR1 was put in record at 17:28:37Z and NBTR2 was put in record at 12:23:51Z. In Orbit 1 at Alaska, NBTR-1 was played back at 16:26:00 and returned to the Record mode at 19:33:04. NBTR-2 was played back at 21:06:58 and returned to Record at 21:13:09 to take its turn alternating with NBTR-1. Thereafter the recorders were alternated in the RECORD mode, and performed their PLAYBACK generally after 1 minute of overlap of the two recorders in the RECORD mode.

Table 15-2 gives the record history for subsequent orbits.

Table 15-3 shows typical telemetry values. All are nominal.

Table 15-4 shows the pre-launch performance of the NBTR's.



Table 15-2. LANDSAT-2 NBTR Record Times

| P/B Orbit | Nbr. | Start Time   | FME | End Time | FME | % Smooth | % BAP | STA |
|-----------|------|--------------|-----|----------|-----|----------|-------|-----|
| 0         |      | 022:17:29:03 | 001 | 19:18:39 | 412 | 0.39     | 0.24  | A   |
| 1         | A    | 022:17:24:15 | 001 | 19:33:03 | 484 | 0.40     | 0.21  | 1A  |
| 2         | B    | 022:20:06:07 | 001 | 21:13:19 | 253 | 0.51     | 0.98  | 2A  |
| 3         | A    | 022:21:13:35 | 001 | 22:51:43 | 369 | 0.09     | 0.00  | A   |
| 4         | B    | 022:22:51:43 | 001 | 00:30:39 | 372 | 0.04     | 0.00  | A   |
| 5         | A    | 023:00:30:23 | 001 | 01:56:15 | 325 | 6.35     | 6.17  | N   |
| 6         | B    | 023:01:56:15 | 001 | 03:49:35 | 426 | 3.29     | 3.15  | A   |
| 7         | A    | 023:03:49:35 | 001 | 05:30:55 | 361 | 6.82     | 6.62  | A   |
| 8         | B    | 023:05:30:55 | 001 | 07:15:11 | 392 | 0.68     | 0.01  | A   |
| 9         | A    | 023:07:15:11 | 001 | 08:58:55 | 390 | 0.07     | 0.07  | A   |
| 10        | B    |              |     |          |     |          |       |     |
| 11        |      |              |     |          |     |          |       |     |
| 12        | A    | 023:08:58:39 | 001 | 12:26:39 | 781 | 10.0     | 9.82  | N   |
| 13        | B    | 023:12:26:23 | 001 | 15:52:15 | 773 | 0.07     | 0.00  | N   |
| 14        | A    | 023:15:51:59 | 001 | 17:49:51 | 443 | 0.63     | 0.51  | G   |
| 15        | B    | 023:17:49:35 | 001 | 19:31:43 | 384 | 0.07     | 0.00  | A   |
| 16        | A    | 023:19:31:27 | 001 | 21:13:35 | 384 | 0.24     | 0.17  | A   |
| 17        | B    | 023:21:13:35 | 001 | 22:55:43 | 384 | 18.28    | 18.28 | A   |
| 18        |      |              |     |          |     |          |       |     |
| 19        | B    | 024:00:25:19 | 001 | 01:59:11 | 353 | 0.08     | 0.00  | A   |
| 20        | A    | 024:01:59:27 | 001 | 03:54:39 | 433 | 0.44     | 0.38  | A   |
| 21        | B    | 024:03:54:23 | 001 | 05:37:03 | 386 | 0.07     | 0.00  | A   |
| 22        | A    | 024:05:36:47 | 001 | 07:21:19 | 393 | 0.07     | 0.01  | A   |
| 23        | B    | 024:07:21:03 | 001 | 09:05:03 | 391 | 0.07     | 0.00  | A   |
| 24        |      |              |     |          |     |          |       |     |
| 25        |      |              |     |          |     |          |       |     |
| 26        | A    | 024:09:05:03 | 001 | 12:33:03 | 781 | 0.06     | 0.00  | N   |
| 27        | B    | 024:12:32:47 | 001 | 15:52:47 | 751 | 0.07     | 0.00  | N   |
| 28        | A    | 024:15:52:31 | 001 | 17:55:27 | 462 | 0.09     | 0.00  | A   |
| 29        | B    | 024:17:55:27 | 001 | 19:37:03 | 382 | 0.07     | 0.00  | A   |
| 30        | A    | 024:19:35:59 | 001 | 21:19:59 | 391 | 0.16     | 0.00  | A   |
| 31        | B    | 024:21:19:11 | 001 | 23:01:51 | 386 | 0.06     | 0.00  | A   |
| 32        | A    | 024:23:01:35 | 001 | 00:43:59 | 385 | 0.31     | 0.24  | A   |
| 33        | B    | 025:00:43:43 | 001 | 02:08:47 | 320 | 0.00     | 0.00  | N   |
| 34        | A    | 025:02:08:31 | 001 | 04:00:47 | 422 | 0.05     | 0.00  | A   |
| 35        | B    | 025:04:00:31 | 001 | 06:08:47 | 482 | 0.21     | 0.00  | A   |
| 36        | A    | 025:05:39:27 | 001 | 07:25:51 | 400 | 0.70     | 0.02  | A   |
| 37        | B    | 025:07:25:35 | 001 | 09:05:35 | 376 | 0.05     | 0.00  | A   |
| 38        |      |              |     |          |     |          |       |     |
| 39        |      |              |     |          |     |          |       |     |
| 40        |      | LOST         |     |          |     |          |       |     |
| 41        | B    | 025:12:34:07 | 001 | 15:37:51 | 690 | 0.06     | 0.00  | N   |
| 42        | A    | 025:15:37:51 | 001 | 17:52:31 | 506 | 0.03     | 0.00  | A   |
| 43        | B    | 025:17:55:27 | 001 | 19:37:19 | 383 | 0.24     | 0.24  | A   |
| 44        | A    | 025:19:37:19 | 001 | 21:19:59 | 386 | 0.29     | 0.25  | A   |
| 45        | B    | 025:21:19:43 | 001 | 23:01:51 | 384 | 0.35     | 0.29  | A   |
| 46        | A    | 025:23:01:51 | 001 | 00:30:23 | 333 | 0.05     | 0.00  | N   |
| 47        | B    | 026:00:30:23 | 001 | 02:09:03 | 371 | 0.05     | 0.00  | N   |
| 48        | A    | 026:02:09:03 | 001 | 04:05:35 | 438 | 0.05     | 0.00  | A   |
| 49        | B    | 026:04:03:11 | 001 | 05:41:19 | 369 | 0.07     | 0.00  | A   |
| 50        | A    | 026:05:41:19 | 001 | 07:26:39 | 396 | 0.05     | 0.00  | A   |

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Table 15-3. Narrow Band Tape Recorder Telemetry Values

| Func. No. | Name                   | *<br>T/V<br>Value<br>20°C<br>Plateau | Orbit<br>36/37 |
|-----------|------------------------|--------------------------------------|----------------|
| 10001     | A-Motor Current (ma)   |                                      |                |
|           | Record                 | 128                                  | 132.0          |
|           | P/B                    | 107                                  | 108.0          |
| 10101     | B-Motor Current (ma)   |                                      |                |
|           | Record                 | 153                                  | 148.5          |
|           | P/B                    | 149                                  | 143.6          |
| 10002     | A-Pwr Supply Cur. (ma) |                                      |                |
|           | Record                 | 185                                  | 170.5          |
|           | P/B                    | 425                                  | 410            |
| 10102     | B-Pwr Supply Cur. (ma) |                                      |                |
|           | Record                 | 260                                  | 260            |
|           | P/B                    | 480                                  | 481            |
| 10003     | A-Recorder Temp (DGC)  | 30.7                                 | 26.1           |
| 10103     | B-Recorder Temp (DGC)  | 28.5                                 | 27.0           |
| 10004     | A-Supply Volt          | 24.9                                 | 24.87          |
| 10104     | B-Supply Volt          | 24.6                                 | 24.55          |

\*Thermal Vacuum Test Data

Table 15-4. Pre-Launch Performance of the Narrowband Tape Recorder

| <u>Components</u>  |             |               |               |
|--|-------------|---------------|---------------|
| NBTR 1   | EAB-QM1     |               |               |
| NBTR 2   | EAB-FT4     |               |               |
| Pre-Launch Performance   |             |               |               |
| <u>Parameter</u>   | <u>Spec</u> | <u>NBTR 1</u> | <u>NBTR 2</u> |
| Record Time  | ≥ 210 min   | 216.5 min     | 216 min       |
| Data quality judged by brush recorder outputs and computer synopsis - quality good |             |               |               |

**SECTION 16**  
**WIDE BAND TELEMETRY SUBSYSTEM**

SECTION 16  
WIDE BAND TELEMETRY SUBSYSTEM

The Wide Band Telemetry Subsystem (WBTS) consists of two 10/20 watt S-Band FM Transmitters and associated filters, antennas, and signal conditioning equipment. The subsystem is used to transmit Return Beam Vidicon (RBV) video data and Multispectral Scanner (MSS) digital data to LANDSAT ground stations. The RBV and MSS data can be transmitted in real time as it is being generated, or recorded on either of two Video Tape Recorders (or both) and played back through the WBTS when in view of a ground station. A Functional Block Diagram is shown in Figure 16-1 and the physical configuration is illustrated in Figure 16-2.

The WBTS was launched in the OFF mode and in the configuration shown in Table 16-1. Verification of this mode was obtained in the telemetry from Madrid and Alaska playback early in Orbit 1. The Check Compare (Table 8) on the CRT verified there were no exceptions to the commanded configuration.

Initial Turn-ON

The Wide Band Telemetry Subsystem was initially turned on in the 10 watt mode in Orbit 12 while over Greenbelt/Merritt Island. At 14:29:31 both wide band power amplifiers were turned on together, with Inverter A ON at 14:29:41. Filters A and B were both inhibited to allow only the unmodulated carrier to radiate.

The power amplifiers were both turned OFF at 14:36:53 and inverter A turned OFF at 14:36:55. All telemetry values were nominal as shown in Table 16-3.

Table 16-1. Wide Band Telemetry Subsystem Launch Mode

|              | Mode      | CMD     |
|--------------|-----------|---------|
| WBPA1, 2 EN  | PRIME/RED | 776/754 |
| WBPA 1       | OFF       | 561     |
| OUTPUT SEL 1 | LO        | 541     |
| WBPA 2       | OFF       | 067     |
| OUTPUT SEL 2 | LO        | 047     |
| RBV Bias     | A         | 546     |
| DATA WBPA    | PRIME     | 705     |

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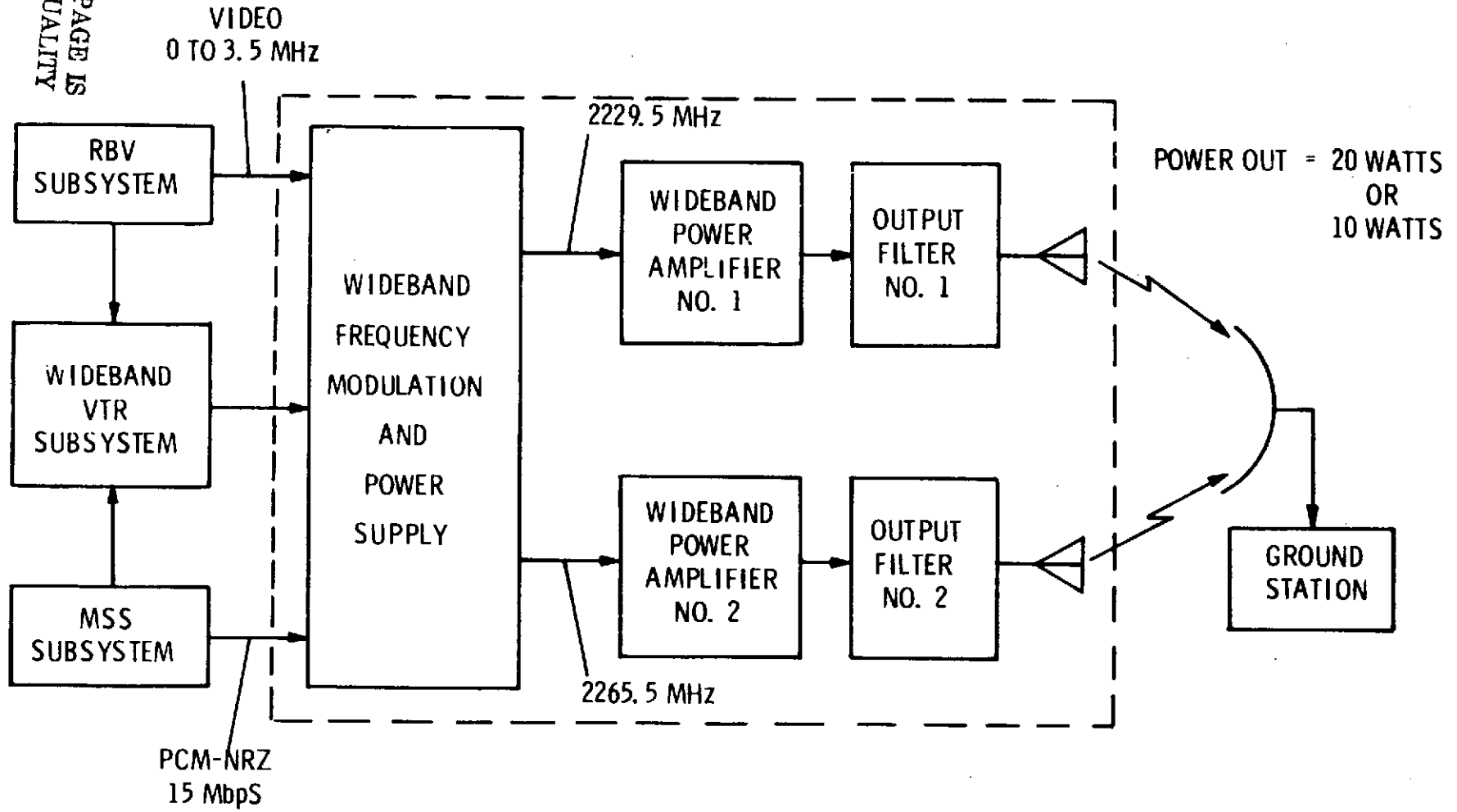
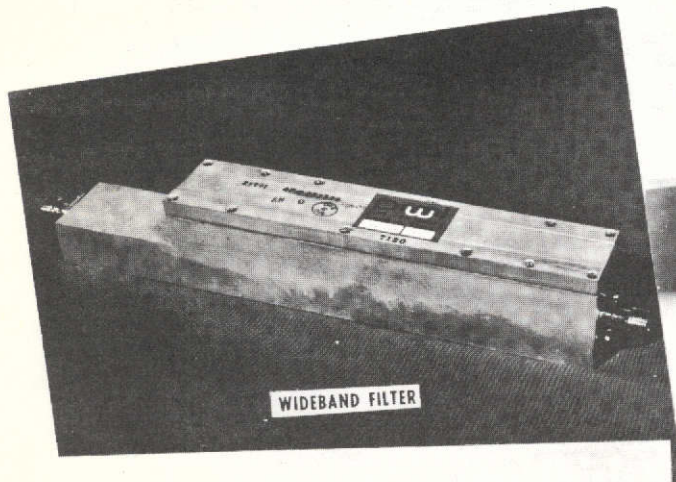
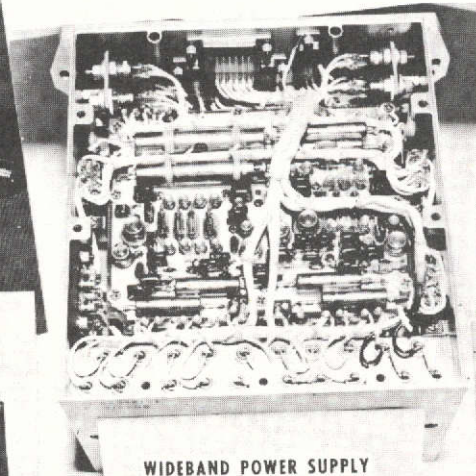


Figure 16-1. Wideband Telemetry Subsystem Block Diagram

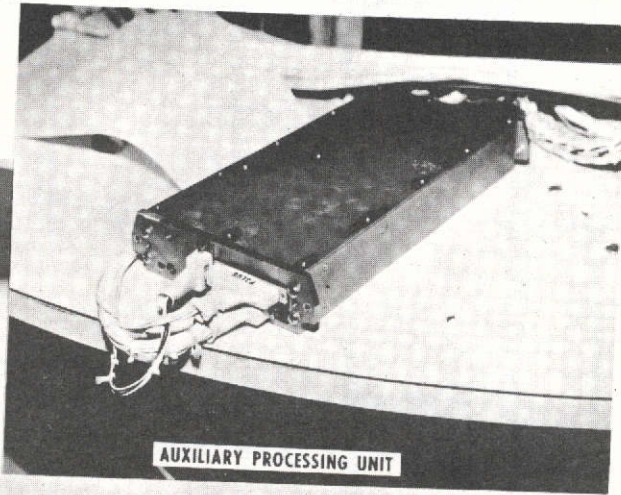
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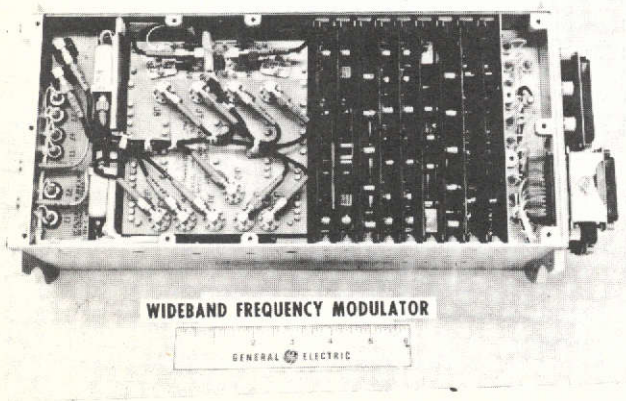
WIDEBAND FILTER



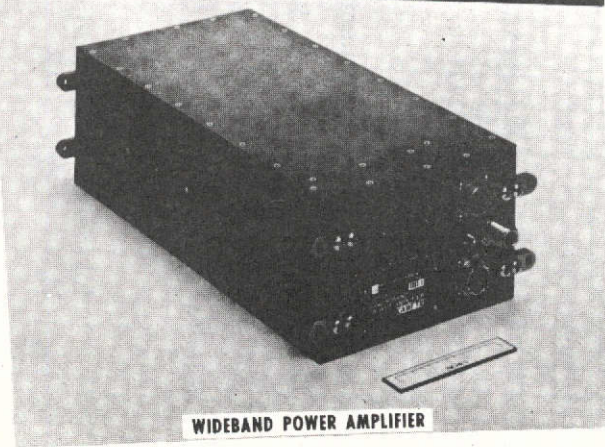
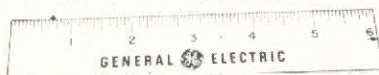
WIDEBAND POWER SUPPLY



AUXILIARY PROCESSING UNIT



WIDEBAND FREQUENCY MODULATOR



WIDEBAND POWER AMPLIFIER

Figure 16-2. Wideband Telemetry Subsystem

### Subsequent Operations

In Orbit 13 both power amplifiers were operated in the 20 watt mode with both filters inhibited. The sequence of events is shown in Table 16-2.

Wide Band Power Amplifier-1 was subsequently operated in Orbits 41, 46 and 47. WBPA-2 was subsequently operated in Orbits 19, 26, 27, 28, 42, 46 and 47. The entire subsystem operated normally throughout these orbits, as shown in the telemetry values of typical orbits shown in Table 16-3.

Prelaunch subsystem performance is shown in Table 16-4.

Table 16.2 Operations of WPA

| WBPA-1   | CMD                | WBPA-2   |
|----------|--------------------|----------|
| 16:10:39 | Power ON           | 16:10:37 |
| 16:10:41 | Inverter ON        | 16:10:41 |
| 16:13:56 | Sel 20 watt output | 16:14:15 |
| 16:17:55 | Power OFF          | 16:17:53 |

Table 16-3. Wide Band Telemetry Subsystem

| (1)   | Name                             | T/V (2) |       | Telemetry Values |          |
|-------|----------------------------------|---------|-------|------------------|----------|
|       |                                  | 10W     | 20W   | 10W              | 20W      |
|       |                                  |         |       | Orbit 16         | Orbit 47 |
| 12001 | Temp, TWT Coll. (DGC)            | 30.1    | 33.6  | 28.14            | 34.38    |
| 12101 |                                  | 27.9    | 31.2  | 25.93            | 30.00    |
| 12002 | Cur, Helix (MA)                  | 3.30    | 3.85  | 3.20             | 4.29     |
| 12102 |                                  | 4.03    | 4.56  | 4.28             | 4.41     |
| 12003 | Cur, TWT Cath. (MA)              | 33.20   | 46.10 | 32.77            | 46.04    |
| 12103 |                                  | 34.09   | 46.78 | 33.93            | 46.42    |
| 12004 | Fwd Power (DBM) (3)              | 40.61   | 42.68 | 40.61            | 42.83    |
| 12104 |                                  | 40.93   | 43.71 | 41.01            | 43.81    |
| 12005 | Refl Power (DBM) (3)             | 22.34   | 27.0  | 21.11            | 26.50    |
| 12105 |                                  | 34.55   | 36.45 | 36.03            | 37.50    |
| 12227 | Con. Volt, Loop Stress (MHz) (4) |         | 1.54  | 1.80             | 2.14     |
| 12228 |                                  |         | 2.53  | 1.48             | 1.51     |
| 12229 | Temp. Mod (DGC)                  |         | 19.5  | 19.00            | 18.51    |
| 12232 | +15 VDC Pwr Sup (TMV) (5)        |         | 2.65  | 2.65             | 2.65     |
| 12234 | -15 VDC Pwr Sup (TMV) (5)        |         | 4.07  | 4.20             | 4.27     |
| 12236 | +5 VDC Pwr Sup (TMV) (5)         |         | 3.55  | 3.55             | 3.57     |
| 12238 | -5 VDC Pwr Sup (TMV) (5)         |         | 4.08  | 4.17             | 4.20     |
| 12240 | -24 VDC Unreg. Pwr (TMV) (5)     |         | 5.86  | 5.88             | 6.20     |
| 12242 | Temp, Inv. (DGC)                 |         | 23.7  | 23.42            | 24.12    |

NOTES:

- (1) Function numbers for WPA-1=120XX; for WPA-2=121XX
- (2) Thermo-Vacuum Test data for comparison
- (3) Pwr outputs of 10 or 20 watts can be selected
- (4) Any reading other than zero or -7.5 is acceptable
- (5) Only power supply A operated during these orbits



Table 16-4. Wideband Telemetry Subsystem

| Components   | S/N       |  |                 |
|--|-----------|--|-----------------|
| Wideband Power Supply  | 6549508   |  |                 |
| Wideband Frequency Modulator   | 6549505   |  |                 |
| Wideband Power Amplifier (2)   | FT3 & FT4 |  |                 |
| Wideband Filter (2)  | 4 & 8     |  |                 |
| <b>Pre-Launch Performance</b>  |           |  |                 |
|  |           | <u>Spec</u>  | <u>Measured</u> |
| Modulator A Freq. Stab.  |           | 2229.5 MHz   | 2229.5 MHz      |
|  |           | ±335 KHz   | +0 KHz<br>-270  |
| Modulator B Freq. Stab.  |           | 2265.5 MHz   | 2265.5 MHz      |
|  |           | ±338 KHz   | +0<br>-280 KHz  |
| Power Amp No. 1 Output*  | High      | +40.6 DBM  | +41.3 DBM       |
|  | Low       | +37.6 DBM  | +38.6 DBM       |
| Power Amp. No. 2 Output*   | High      | +40.6 DBM  | +40.8 DBM       |
|  | Low       | +37.6 DBM  | +37.8 DBM       |
| <u><b>PROBLEM SUMMARY</b></u>  |           |  |                 |
| <b>Problem</b>   |           |  |                 |
| <ul style="list-style-type: none"> <li>• Jumps in helix current telemetry seen in both WBPA's.<br/>WBPA 1 - 1.1 MA<br/>WBPA 2 - 0.65 MA<br/>EBPR 435, 9/3/74<br/>EBPR 520, 10/17/74</li> </ul> |           | <ul style="list-style-type: none"> <li>• No degradation of performance observed. WBPA's in LANDSAT-1 also show helix current telemetry jumps (once per 2 or 3 transmissions).</li> </ul> |                 |

\*Includes 2 DB transmit circuit loss

SECTION 17

ATTITUDE MEASUREMENT SENSOR (AMS)

SECTION 17  
ATTITUDE MEASUREMENT SENSOR (AMS)

The AMS is a passive radiometric balance sensor which operates in the 14 - 16 micron IR Band. This band pass was selected to take advantage of the earth's horizon predictability in the 14-16 micron region, and to improve the off-null accuracy by ground based correction. The entire earth disk is imaged by a germanium lens to a focal surface containing four light pipes (four field of view sectors). See Figure 17-1 for functional block diagram, and Figure 17-2 for hardware illustration. AMS Telemetry Values are shown in Table 17-1.

The AMS was launched in the OFF mode (CMD 774), turned ON during Orbit 6 and has been performing normally since then.

Table 17-1. AMS Telemetry Values

| Function No. |                   | Units | Average Value |              |          |
|--------------|-------------------|-------|---------------|--------------|----------|
|              |                   |       | Orbit 7       | 20°C Plateau | Orbit 50 |
| 3004         | Case - Temp 1     | °C    | 15.74         | 20.9         | 19.00    |
| 3005         | Assembly - Temp 2 | °C    | 15.28         | 20.5         | 18.70    |

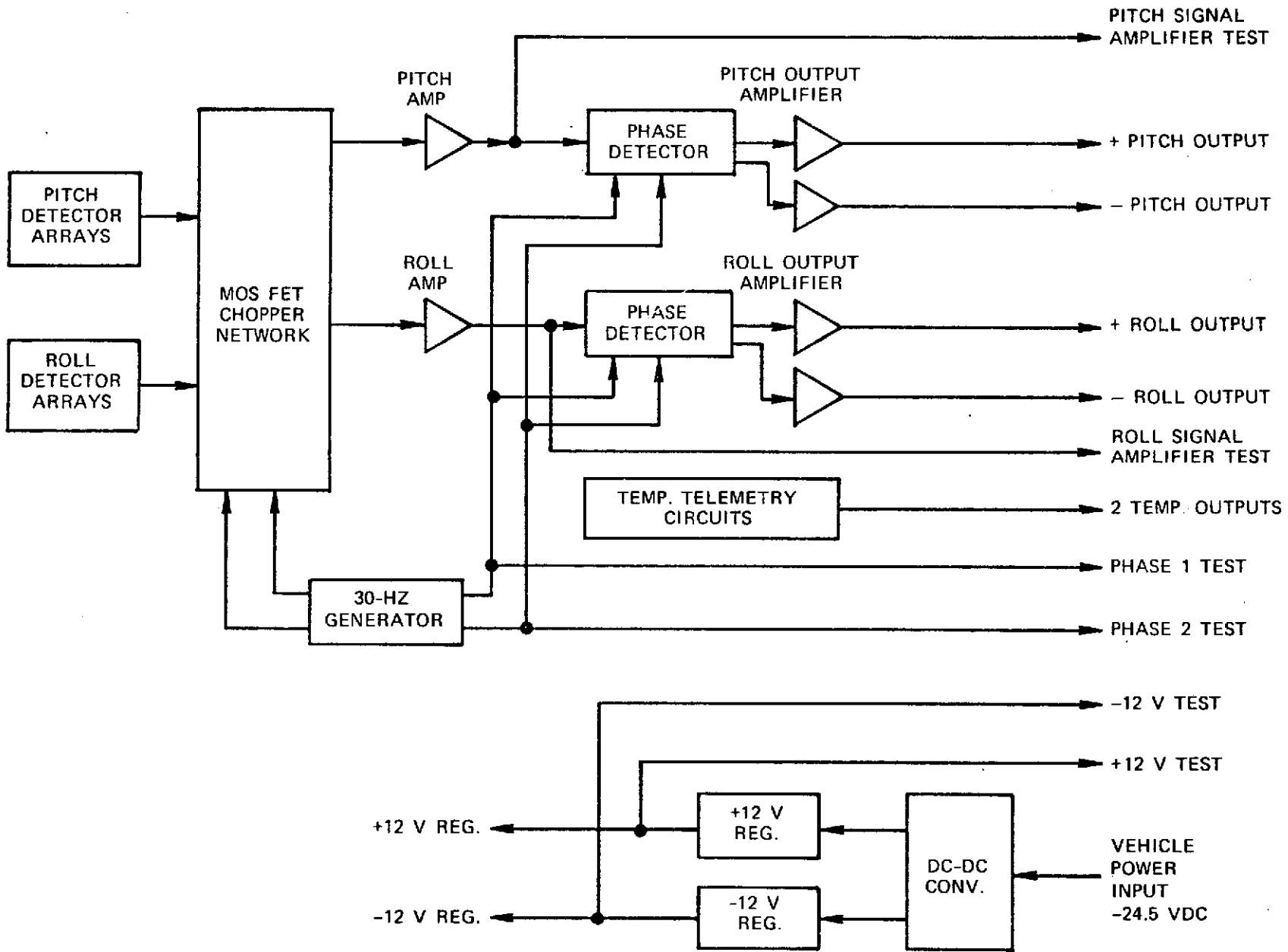


Figure 17-1. AMS Block Diagram

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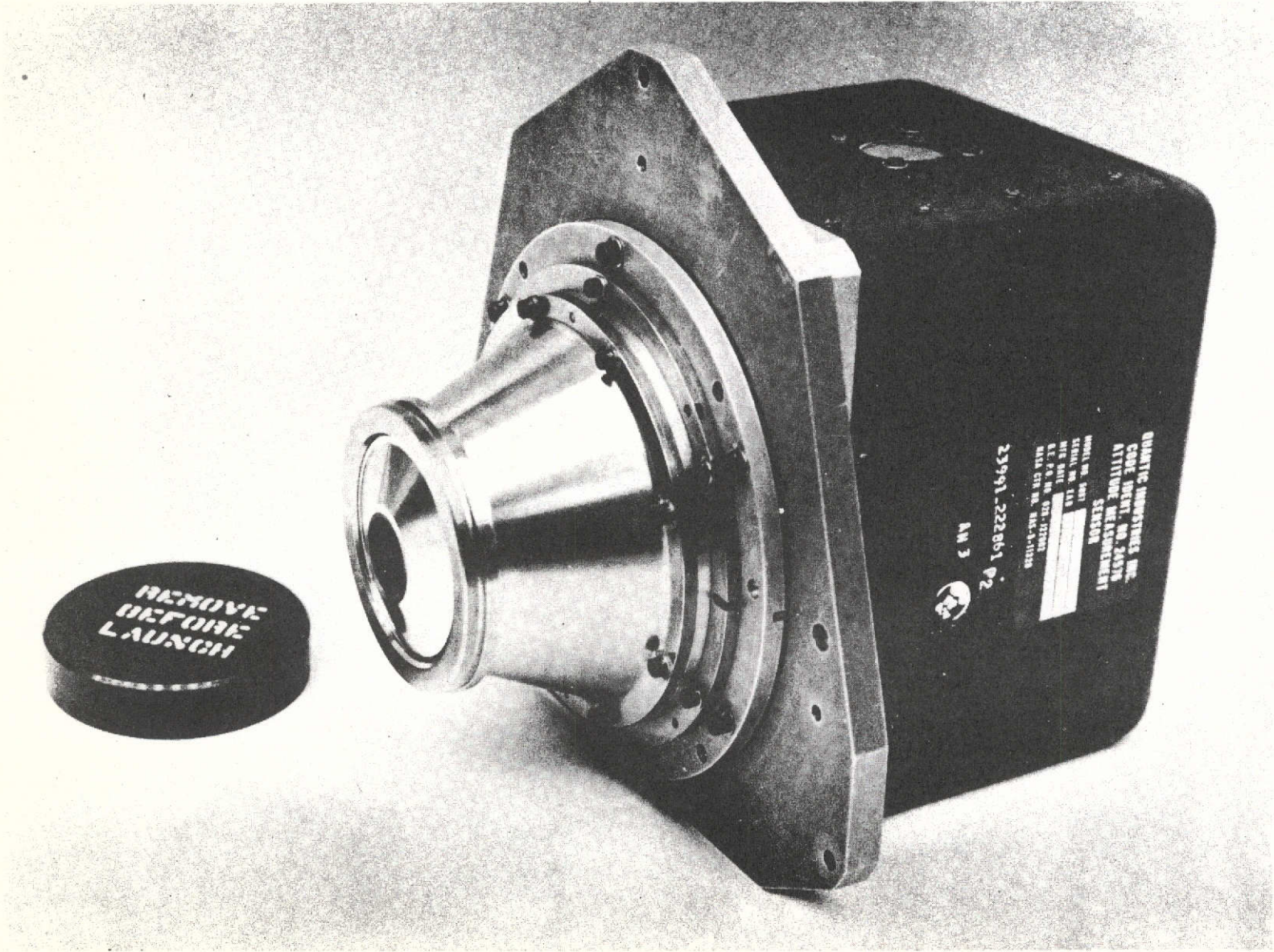


Figure 17-2. Attitude Measurement Sensor

SECTION 18  
WIDEBAND VIDEO TAPE RECORDERS (WBVTR)

## SECTION 18

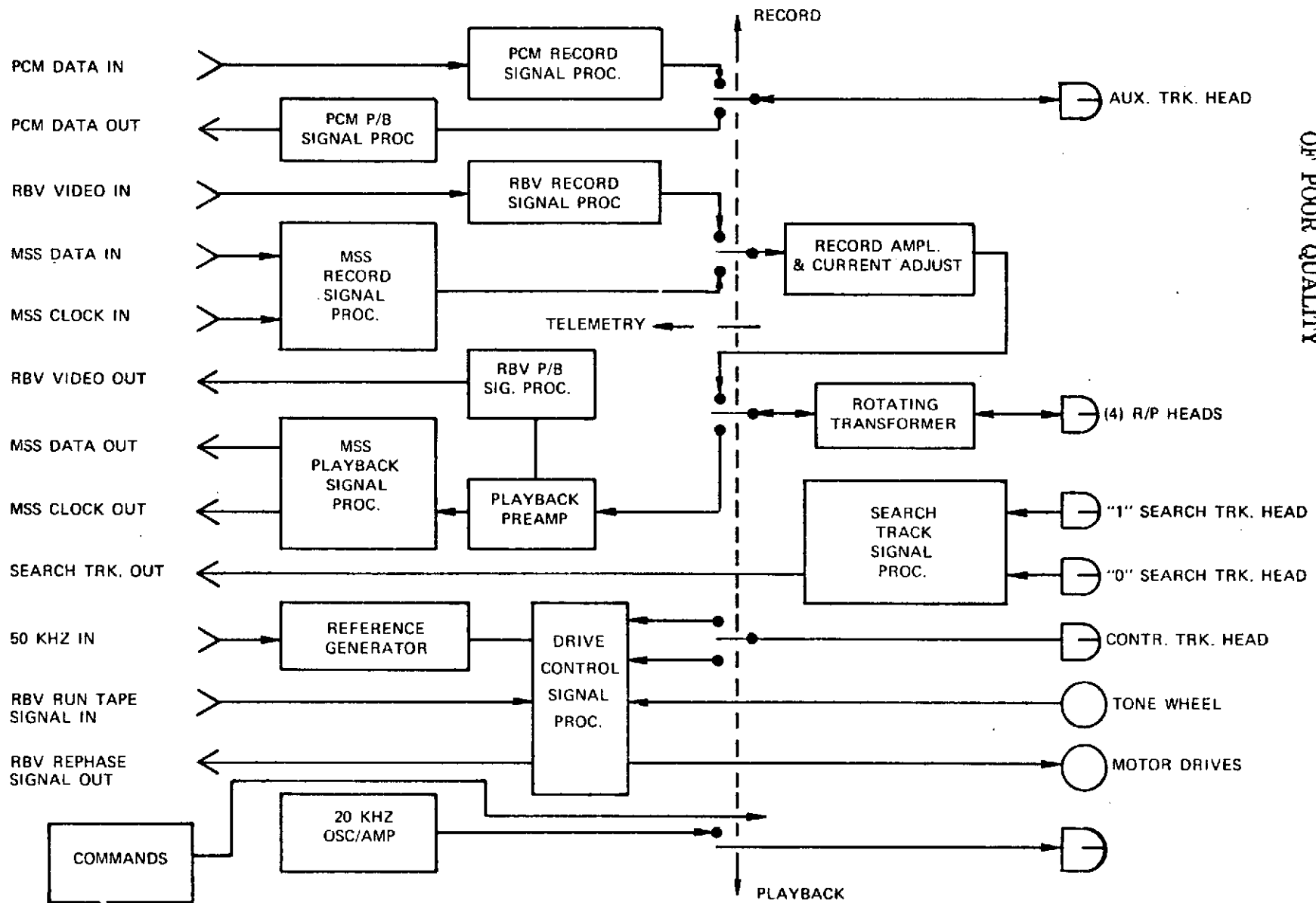
### THE WIDEBAND VIDEO TAPE RECORDERS (WBVTR)

The Wideband Video Tape Recorder (WBVTR) Subsystem is comprised of two rotating-head, magnetic tape recorders, each housed in two enclosures: (1) a pressurized housing for the Transport Unit (TU) and; (2) an unpressurized enclosure for the Electronics Unit (EU). The TU includes the transport mechanism, the video head wheel, record amplifiers, playback pre-amplifiers, and transport controls. The EU includes the record and playback formatting circuitry, the voltage converter, motor control circuits and command and control circuits.

The primary function of either WBVTR is to selectively record, store, and playback analog data from the Return Beam Vidicon (RBV) cameras or digital data from the Multispectral Scammer (MSS) Subsystem. Additional record and playback channels are provided on the tape. These include a prerecorded Search Track Signal for providing tape position information, an Auxiliary Track for recording PCM telemetry data, and a servo control track for playback speed control. A transverse recording technique utilizing four rotating heads is used for Wideband RBV and MSS data. The narrowband data, (servo control, PCM data, and search pattern) are recorded longitudinally with fixed heads. See Figures 18-1 and 18-2 for functional block diagrams. Figures 18-3, 4 and 5 show physical configuration. The launch and activation evaluation follows.

#### LAUNCH MODE

The Wideband Video Tape Recorders 1 and 2 (WBVTR-1 and 2) were launched in the mode shown in Table 18-1. This launch mode was verified by OCC during prelaunch checkout at WTR, and subsequently by narrow band recorder playback from Alaska.



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Figure 18-1. WBVTR Functional Block Diagram



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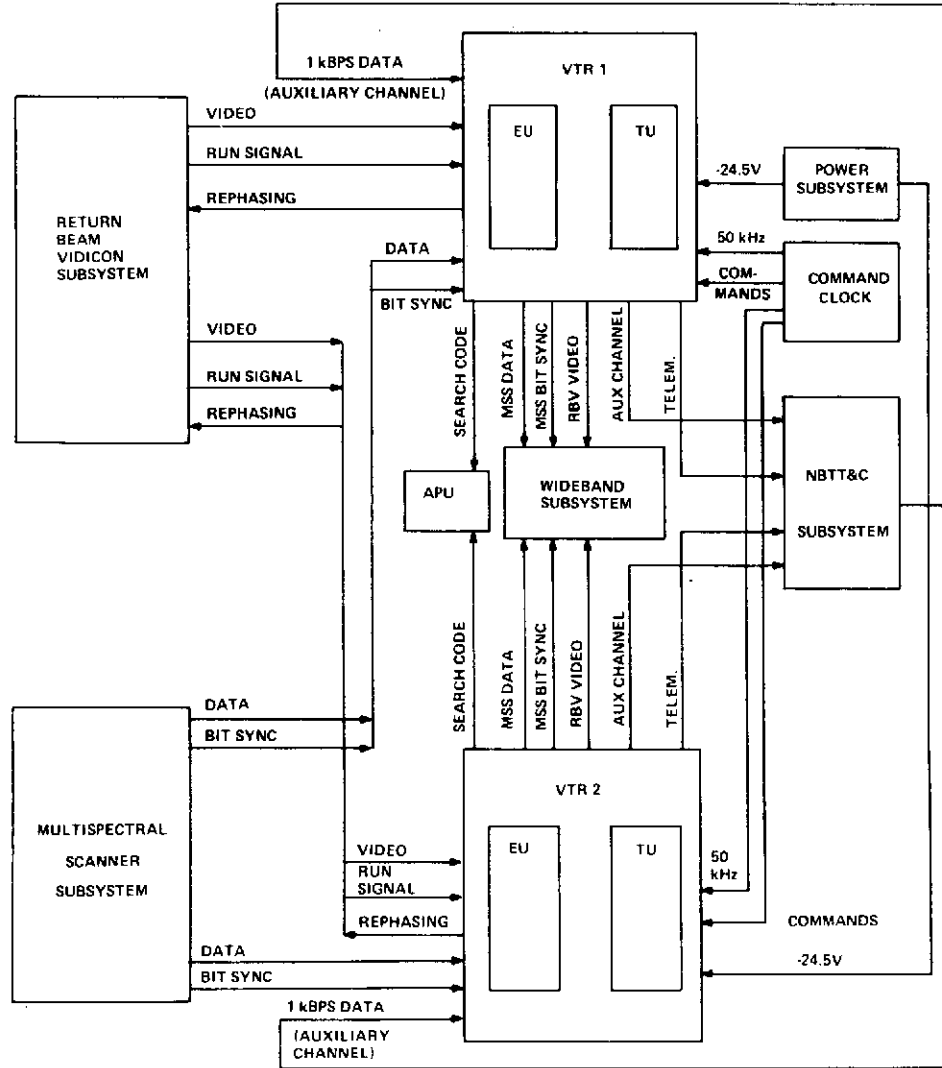


Figure 18-2. WBVTR Block Diagram

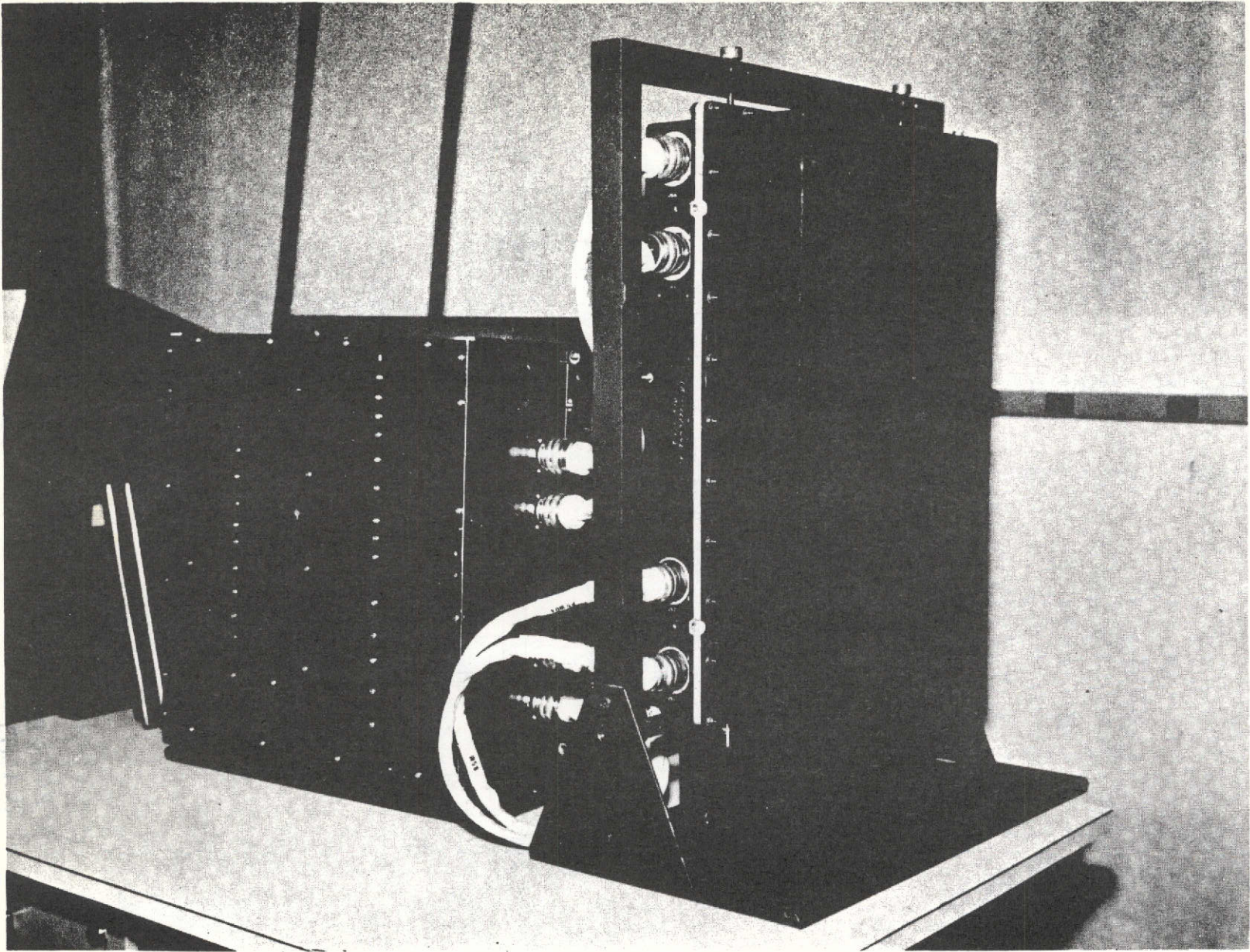


Figure 18-3. Wideband Video Tape Recorder

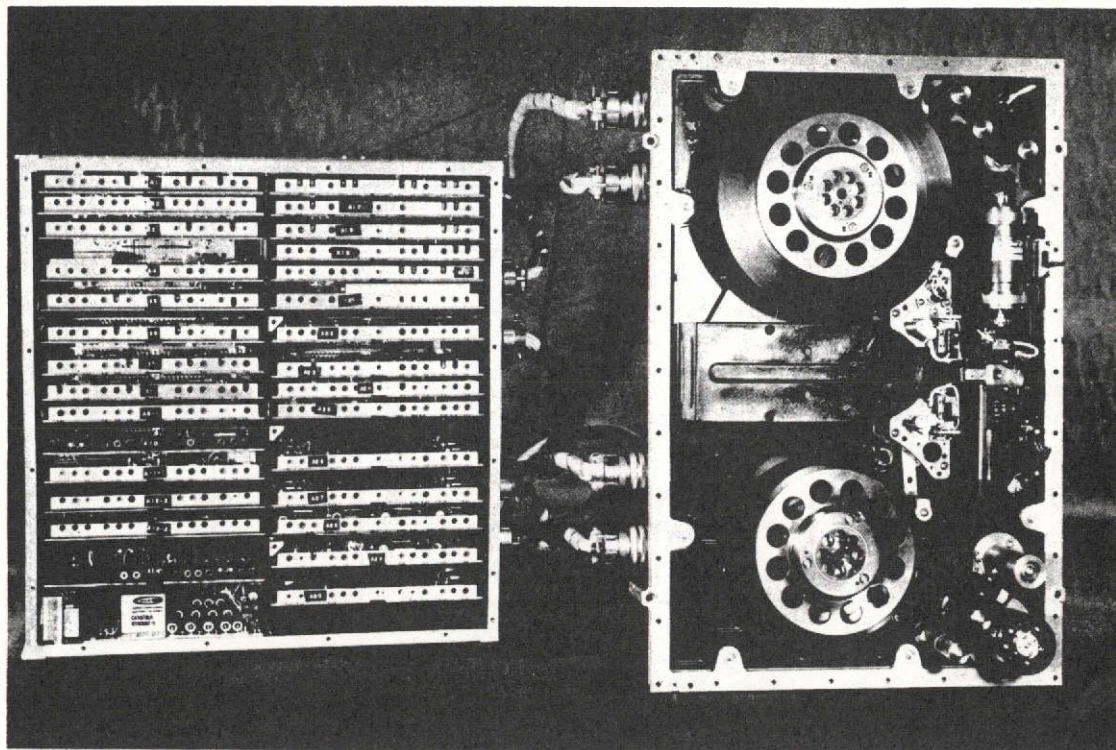


Figure 18-4. Wideband Video Tape Recorder

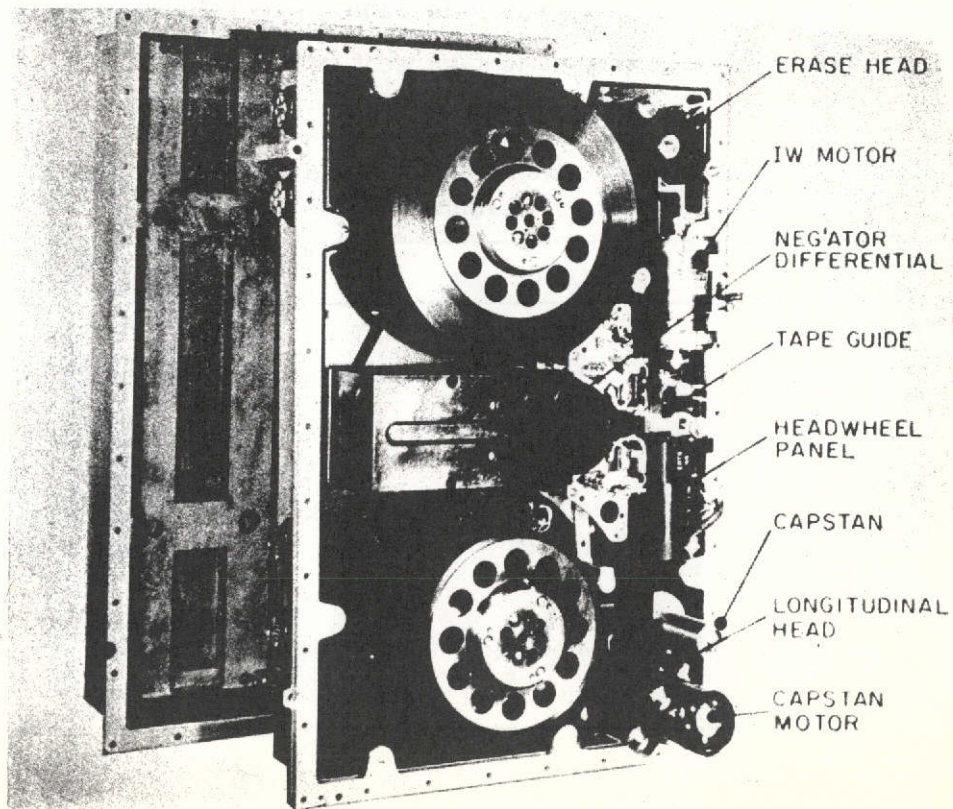


Figure 18-5. WBVTR Transport

Table 18-1. Launch Configuration

|            | Mode          | Cmd |
|------------|---------------|-----|
| WBVTR 1    | OFF           | 651 |
| WBVTR 2    | OFF           | 712 |
| RBV STBY   | 1             | 464 |
| MSS STBY   | 2             | 572 |
| VO PROT 2  | EN            | 554 |
| VO PROT 1  | EN            | 467 |
| SEARCH TRA | NORM          | 563 |
| WBVTR-1    | TAPE POSITION | 900 |
| WBVTR-2    | TAPE POSITION | 919 |

ACTIVATION

Initial activation of the WBVTR subsystem occurred in Orbit 5. Both recorders were rewound from their launch position near mid-tape for a duration of about 2 minutes. The applicable series of commands are shown in Table 18-2. The footage count of WBR-1 went from 900 to 423; the WBR-2 footage went from 919 to 423.

Table 18-2. Series of Commands for Initial Activation of WBVTR  
Orbit 5, 23 January 1975

| Time     | Cmd | Activity       |
|----------|-----|----------------|
| 01:59:08 | 650 | WBR-2 ON Prime |
| 01:59:10 | 572 | WBR-2 STBY MSS |
| 01:59:15 | 607 | WBR-1 ON Prime |
| 01:59:17 | 464 | WBR-1 STBY RBV |
| 01:59:22 | 465 | WBR-1 FAST R/W |
|          | 552 | WBR-2 FAST R/W |
| 02:01:06 | 071 | APU Norm Mode  |
| 02:01:17 | 572 | WBR-2 STBY MSS |
| 02:01:19 | 464 | WBR-1 STBY RBV |
| 02:01:20 | 712 | WBR-2 OFF      |
| 02:01:21 | 651 | WBR-1 OFF      |

## SUBSEQUENT OPERATIONS

Table 18-3 shows the subsequent use of the WBVTR subsystem. All operations were nominal. Telemetry values and MFSE counts are normal and are shown in Tables 18-4, 18-5, and 18-6. All values are nominal.

Tables 18-7 and 18-8 show the prelaunch performance of the WBVTR. Table 18-8 lists the components and ground operating time.

Table 18-3. History of WBVTR Use

| Mode     | Orbits   |  |
|----------|--|--|
|          | WBR-1  | WBR-2  |
| Record   | 40, 41   | 19, 21   |
| Rewind   | 5, 16, 17, 34, 46  | 5, 16, 17, 26, 31, 46                                    |
| Playback | 15, 17, 33 & 47 (pre-launch recorded)<br>46 (rec. at RBV activation) | 15, 17, 46, 47 (recorded pre-launch)<br>26 (MSS sun cal) |

Table 18-4. WBVTR Telemetry Values

| WBVTR-1 Functions |                 |       | Telemetry Values in Orbits |           |
|-------------------|-----------------|-------|----------------------------|-----------|
| Number            | Name            |       | T/V                        | ORB 45/46 |
| 13022             | Pressure, Trans | (PSI) | 16.46                      | 16.52     |
| 13023             | Temp Trans      | (DgC) | 19.1                       | 20.74     |
| 13024             | Temp Elec       | (DgC) | 31.8                       | 25.00     |
| 13032             | Lim Volt Out    | (VPP) | 1.47                       | 1.48      |
| 13034             | +5.6 VDC Conv   | (VDC) | 5.54                       | 5.70      |
| 13200             | -24.5 VDC       | (VDC) | NA                         | 1.82      |
| 13201             | -12 VDC         | (VDC) | NA                         | 2.44      |
| 13202             | Temp APU        | (DgC) | NA                         | 29.06     |

| WBVTR-2 Functions |                 |       | Telemetry Values in Orbits |           |
|-------------------|-----------------|-------|----------------------------|-----------|
| Number            | Name            |       | T/V                        | ORB 45/46 |
| 13122             | Pressure, Trans | (PSI) | 16.22                      | 16.12     |
| 13123             | Temp Trans      | (DgC) | 18.9                       | 21.50     |
| 13124             | Temp Elec       | (DgC) | 31.2                       | 23.50     |
| 13132             | Lim Volt Out    | (VPP) | 1.3                        | 1.30      |
| 13134             | +5.6 VDC        | (VDC) | 5.57                       | 5.71      |
| 13200             | -24.5 VDC       | (VDC) | NA                         | 1.82      |
| 13201             | -12 VDC         | (VDC) | NA                         | 2.44      |
| 13202             | Temp APU        | (DgC) | NA                         | 29.06     |

NA = not available

Table 18-5. Function Values by Mode in Orbit

| WBVTR-1<br>Function/Description | T/V    | ORB 31/46 |
|---------------------------------|--------|-----------|
| 13029 - Input P/B Voltage       |        |           |
| Record                          | 0.0    | 0.0       |
| Playback                        | 0.57   | 0.60      |
| Rewind                          | 0.0    | 0.0       |
| Standby                         | 0.0    | 0.0       |
| 13028 - Capstan Motor Current   |        |           |
| Record                          | 0.32   | 0.31      |
| Playback                        | 0.29   | 0.26      |
| Rewind                          | 0.23   | 0.19      |
| Standby                         | 0.0    | 0.0       |
| 13030 - Headwheel Motor Current |        |           |
| Record                          | 0.50   | 0.50      |
| Playback                        | 0.495  | 0.49      |
| Rewind                          | 0.41   | 0.44      |
| Standby                         | 0.41   | 0.45      |
| 13031 - Recorder Input Current  |        |           |
| Record                          | 3.58   | 3.69      |
| Playback                        | 3.92   | 3.37      |
| Rewind                          | 2.18   | 2.23      |
| Standby                         | 1.79   | 1.78      |
| 13033 - Servo Voltage           |        |           |
| Record                          | 0.0    | 0.0       |
| Playback                        | 49.99  | 50.01     |
| Rewind                          | 0.0    | 0.0       |
| Standby                         | 0.0    | 0.0       |
| 13026 - Capstan Motor Speed     |        |           |
| Record                          | 89.77  | 88.61     |
| Playback                        | 89.37  | 88.35     |
| Rewind                          | 100.12 | 100.2     |
| Standby                         | 0.0    | 0.0       |
| 13027 - Headwheel Motor Speed   |        |           |
| Record                          | 97.5   | 96.72     |
| Playback                        | 96.86  | 97.28     |
| Rewind                          | 98.96  | 98.6      |
| Standby                         | 99.12  | 98.39     |

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Table 18-6. Function Values by Mode in Orbit

| WBVTR-2<br>Function/Description | T/V    | ORB 31/46 |
|---------------------------------|--------|-----------|
| 13129 - Input P/B Voltage       |        |           |
| Record                          | 0.0    | 0.0       |
| Playback                        | 0.37   | 0.35      |
| Rewind                          | 0.0    | 0.0       |
| Standby                         | 0.0    | 0.0       |
| 13128 - Capstan Motor Current   |        |           |
| Record                          | 0.33   | 0.33      |
| Playback                        | 0.34   | 0.33      |
| Rewind                          | 0.16   | 0.20      |
| Standby                         | 0.0    | 0.0       |
| 13130 - Headwheel Motor Current |        |           |
| Record                          | 0.47   | 0.47      |
| Playback                        | 0.46   | 0.48      |
| Rewind                          | 0.43   | 0.44      |
| Standby                         | 0.45   | 0.43      |
| 13131 - Recorder Input Current  |        |           |
| Record                          | 2.88   | 2.90      |
| Playback                        | 3.11   | 3.14      |
| Rewind                          | 1.79   | 1.80      |
| Standby                         | 1.18   | 1.51      |
| 13133 - Servo Voltage           |        |           |
| Record                          | 0.0    | 0.0       |
| Playback                        | 48.92  | 49.00     |
| Rewind                          | 0.0    | 0.0       |
| Standby                         | 0.0    | 0.0       |
| 13126 - Capstan Motor Speed     |        |           |
| Record                          | 108.66 | 112.10    |
| Playback                        | 108.38 | 112.10    |
| Rewind                          | 130.09 | 120.43    |
| Standby                         | 0.0    | 0.0       |
| 13127 - Headwheel Motor Speed   |        |           |
| Record                          | 98.41  | 98.08     |
| Playback                        | 98.11  | 97.04     |
| Rewind                          | 99.95  | 98.6      |
| Standby                         | 101.72 | 100.79    |

Table 18-7. Pre-Launch WBVTR History

| <u>DATE</u>         | <u>ACTIVITY</u>   |        |        |      |      |      |      |      |      |       |       |     |      |      |       |        |        |      |      |
|---------------------|---|--------|--------|------|------|------|------|------|------|-------|-------|-----|------|------|-------|--------|--------|------|------|
| 5/28 - 6/12/74      | 1ST THERMAL VACUUM TEST. VTR 1 - FT 2 VTR 2 - FT 2<br><br>EACH RECORDER SHOWED RISING ERROR RATE DURING 30 MINUTE TESTS, MORE PRO-<br>NOUNCED AT HIGH TEMPERATURE. FT 1 ERROR RATE CONSIDERABLY HIGHER THAN FT 2<br>ERROR RATE.<br><br>MINOR FRAME SYNC ERRORS IN TEN SECONDS NEAR BOT & EOT<br><br><table border="1"> <thead> <tr> <th>VTR</th> <th>PRE TV</th> <th>20°C</th> <th>35°C</th> <th>10°C</th> <th>20°C</th> </tr> </thead> <tbody> <tr> <td>FT 2</td> <td>6-14</td> <td>12-70</td> <td>20-85</td> <td>3-5</td> <td>3-10</td> </tr> <tr> <td>FT 1</td> <td>5-130</td> <td>10-160</td> <td>20-480</td> <td>5-75</td> <td>8-95</td> </tr> </tbody> </table><br>OBSERVED CHANGE (HIGHER) CAPSTAN MOTOR CURRENT TELEMETRY IN VACUUM ON FT 2.<br><br>OBSERVED SEVERAL INSTANCES OF SIMULTANEOUS PBOT & SBOT ON FT 2. | VTR    | PRE TV | 20°C | 35°C | 10°C | 20°C | FT 2 | 6-14 | 12-70 | 20-85 | 3-5 | 3-10 | FT 1 | 5-130 | 10-160 | 20-480 | 5-75 | 8-95 |
| VTR                 | PRE TV  | 20°C   | 35°C   | 10°C | 20°C |      |      |      |      |       |       |     |      |      |       |        |        |      |      |
| FT 2                | 6-14  | 12-70  | 20-85  | 3-5  | 3-10 |      |      |      |      |       |       |     |      |      |       |        |        |      |      |
| FT 1                | 5-130   | 10-160 | 20-480 | 5-75 | 8-95 |      |      |      |      |       |       |     |      |      |       |        |        |      |      |
| 6/16/74             | POST TV TESTS<br><br>1. DETERMINE IF FT 1 RECORD CURRENT (1 DB) WAS OPTIMUM - IT WAS.<br><br>2. DETERMINE IF SIMULTANEOUS MSS ERROR BURSTS & AUX TRACK DROPOUTS WERE<br>CONTROL TRACK ANOMALY - THEY ARE.<br><br>3. DETERMINE IF SUBSTITUTE TELEMETRY BOARD NORMALIZES CAPSTAN MOTOR<br>CURRENT TELEMETRY ON FT 2 - IT DIDN'T   |        |        |      |      |      |      |      |      |       |       |     |      |      |       |        |        |      |      |
| 6/21/74             | FT 1 & FT 2 RETURNED TO RCA.  |        |        |      |      |      |      |      |      |       |       |     |      |      |       |        |        |      |      |
| 7/16/74             | FT 6 DELIVERED TO GE. TESTS RUN WITH FT 6 IN EACH OF VTR 1 & 2 POSITIONS, MSS<br>ERRORS VERY LOW IN EACH POSITION. SEARCH TRACK ERRORS NOTED IN 12 PLACES.  |        |        |      |      |      |      |      |      |       |       |     |      |      |       |        |        |      |      |
| 7/23/74 - 7/26/74   | MSS DATA TESTS WITH FT 1 IN VTR 1 POSITION AND FT 6 IN VTR 2 POSITION. FT 6<br>LOW ERROR RATE. FT 1 RELATIVELY LOW, BUT RISING ERROR RATE. (5-30)   |        |        |      |      |      |      |      |      |       |       |     |      |      |       |        |        |      |      |
| 7/29/74 - 7/31/74   | MSS DATA TESTS WITH FT 2 IN VTR 1 POSITION AND FT 6 IN VTR 2 POSITION. FT 2<br>SHOWED RISING ERROR RATE ON 3 SUCCESSIVE PLAYBACKS. FT 6 SHOWED LOW ERROR<br>RATE WITH SAME DATA.  |        |        |      |      |      |      |      |      |       |       |     |      |      |       |        |        |      |      |
| 8/2/74 - 8/13/74    | SERIES OF TESTS WITH FT 2 AND FT 6 IN FLIGHT SPACECRAFT AS VTR 1 AND 2, AND<br>WITH FT 1 ON BIT BOARD. TESTS DISCLOSED PATTERN SENSITIVITY, AND CHARACTER<br>OF ERRORS WAS NOTED AND ANALYZED. FT 1 WAS RETURNED TO RCA FOR FURTHER<br>ANALYSIS, WHERE MODIFICATIONS WERE DEVELOPED AND APPLIED TO FT 1.  |        |        |      |      |      |      |      |      |       |       |     |      |      |       |        |        |      |      |
| 8/28/74             | PRE-THERMAL/VACUUM TESTS. FT 2 SHOWED HIGH AND RISING ERROR RATE DURING<br>30 MINUTE TEST (150-450). FT 6 SHOWED GOOD ERROR RATE (5-5).   |        |        |      |      |      |      |      |      |       |       |     |      |      |       |        |        |      |      |
| 9/3/74 - 9/10/74    | SECOND SPACECRAFT THERMAL VACUUM TEST. FT 2 SHOWED RISING ERROR RATE,<br>AND HIGH (70-100) AT HIGH TEMPERATURE. FT 6 SHOWED CONSISTENTLY LOW ERROR<br>RATE.   |        |        |      |      |      |      |      |      |       |       |     |      |      |       |        |        |      |      |
| 10/4/74             | FT 1, WITH MODIFICATIONS, DELIVERED TO GE AND PLACED IN BONDED STOCK.   |        |        |      |      |      |      |      |      |       |       |     |      |      |       |        |        |      |      |
| 10/16/74 - 10/18/74 | SPACECRAFT VIBRATION TEST. VTR 1-FT 2. VTR 2-FT 6. DURING SPACECRAFT<br>CONFIDENCE TESTS RUN BEFORE, BETWEEN AND AFTER VIBRATIONS, FT 2 SHOWED<br>HIGHER ERROR RATE ON EACH SECOND PLAYBACK OF MSS DATA.  |        |        |      |      |      |      |      |      |       |       |     |      |      |       |        |        |      |      |
| 10/29/74 - 10/30/74 | POST VIBRATION 30-MINUTE MSS DATA TEST SHOWED HIGH ERROR RATE (100-230)<br>ON FT 2. SECOND AND THIRD PB'S ALSO HIGH. FT 6 GOOD.   |        |        |      |      |      |      |      |      |       |       |     |      |      |       |        |        |      |      |
| 10/30 - 10/31/74    | LIMITER/DEMOD BOARDS REMOVED FROM FT 2 EU AND SENT TO RCA FOR SINGLE<br>MODIFICATION. BOARDS RETURNED TO GE AND REPLACED IN EU. ERROR RATE<br>HIGH (150-900).   |        |        |      |      |      |      |      |      |       |       |     |      |      |       |        |        |      |      |
| 11/5 - 11/8/74      | COMPLETION OF MODIFICATIONS TO FT 2 AT GE. FINAL TESTS SHOWED VERY GOOD<br>ERROR RATE WITH NO RISE (5-5).   |        |        |      |      |      |      |      |      |       |       |     |      |      |       |        |        |      |      |
| 11/9 - 11/12/74     | FT 2 EU REMOVED FROM SPACECRAFT FOR VIBRATION AND THERMAL TESTS (UN-<br>POWERED) AT RCA. EU BENCH TEST AT GE WITH ENGINEERING MODEL T/V. EU<br>INSTALLED ON SPACECRAFT. MSS DATA FROM 11/8/74 PLAYED BACK AND NEW<br>30-MINUTE RECORD/PLAYBACK TEST RUN. LOW ERROR RATE WITH NO RISE (5-5).   |        |        |      |      |      |      |      |      |       |       |     |      |      |       |        |        |      |      |



Table 18-8. Pre-Launch WBVTR Problem Summary

| <u>PROBLEM</u>  | <u>RESOLUTION</u>  |
|---|--|
| <ul style="list-style-type: none"> <li>VTR FT-2 CAPSTAN MOTOR CURRENT TELEMETRY INCREASED IN VACUUM. EBPR 271. 5/29/74.</li> </ul>  | <ul style="list-style-type: none"> <li>CAUSED BY SATURABLE REACTOR IN TELEMETRY CIRCUIT AFFECTED BY VACUUM. RCA REPLACED SATURABLE REACTOR. MR D08193.</li> </ul>  |
| <ul style="list-style-type: none"> <li>SIMULTANEOUS AUXILIARY TRACK DROPOUT WITH MSS DATA ERROR BURST. EBPR 375, 6/11/74 (SN FT-2) EBPR 378, 7/15/74 (SN FT-6).</li> </ul>                | <ul style="list-style-type: none"> <li>OCCURS RELATIVELY INFREQUENTLY ON ALL VTR'S, INCLUDING ERTS A. DUE TO MOMENTARY LOSS OF LOCK IN CAPSTAN SERVO LOOP. ACCEPT AS IS. MP D08168 FT 2, MR D08194 FT 6.</li> </ul>  |
| <ul style="list-style-type: none"> <li>RISING MSS MINOR FRAME SYNC ERROR RATE.<br/>EBPR'S   097       10/19/74<br/>          124       2/28/74<br/>          133       3/21/74</li> </ul> | <ul style="list-style-type: none"> <li>LONG SERIES OF TESTS AT RCA AND GE REVEALED SOME PROBLEMS WITHIN VTR'S. RCA RECOMMENDED AND MADE MODIFICATIONS TO SN FT 1 AND FT 2:               <ol style="list-style-type: none"> <li>DECREASE RINGING (MAKE HF ROLL OFF SMOOTHER) IN MSS PB CIRCUITS.</li> <li>INCREASE TIME CONSTANT OF DC RESTORER.</li> <li>DECREASE AMPLITUDE OF PILOT TONE (1.5 MHZ) SIGNAL IN RECORD CIRCUITS. MR D08150 FT 1, MR D08195 FT 2.</li> </ol> </li> </ul> |
| <ul style="list-style-type: none"> <li>SEARCH TRACK NUMBERS ERRATIC ON VTR FT-6. EBPR 377 7/18/74.</li> </ul>   | <ul style="list-style-type: none"> <li>ABOUT 20 NUMBERS (OUT OF 3600) SOMETIMES READ OUT INCORRECTLY, APPARENTLY DUE TO EXTRA BITS (OR NOISE) ON TAPE. INCORRECT NUMBERS HAVE NO HARMFUL EFFECT TO OPERATION SINCE NUMBERS ARE HIGHLY REDUNDANT. ACCEPT AS IS. MR D08170.</li> </ul>   |
| <ul style="list-style-type: none"> <li>PRESSURE TELEMETRY DROPPED AND RETURNED TO NORMAL A FEW MINUTES LATER. VTR FT-6, EBPR 462 9/6/74.</li> </ul>                                       | <ul style="list-style-type: none"> <li>POTENTIOMETERS SHOW OCCASIONAL NOISE. OCCURRED ALSO ON ERTS A. ACCEPT AS IS. MR D08267.</li> </ul>  |
| <ul style="list-style-type: none"> <li>TAPE TRANSPORT UNIT FT-2 TELEMETRY INDICATED BOTH PRIMARY AND SECONDARY BEGINNING OF TAPE INDICATIONS. (5/28/74) EBPR 262, MR D08196.</li> </ul>   | <ul style="list-style-type: none"> <li>RETURNED TO CONTRACTOR AND REWORKED. CLOSED.</li> </ul>   |

RBV DATA

- NO SIGNIFICANT DEGRADATION OF RBV DATA.

MSS DATA

- BOTH VTR'S HAVE MSS MINOR FRAME SYNC ERRORS BELOW 10 ERRORS IN 10 SECONDS. AVERAGE APPROXIMATELY 5 IN 10 SECONDS.
- NO SIGNIFICANT RISE IN ERRORS DURING 30 MINUTE PLAYBACK.

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Table 18-9. WBVTR Components

|   |          |                                       |
|---|----------|---------------------------------------|
| ● IN SPACECRAFT                                 |          |                                       |
|   |          | TAPE CONTACT TIME<br>(AS OF 11/25/74) |
| VTR 1   | S/N FT-2 | 522 HOURS                             |
| VTR 2   | S/N FT-6 | 114.5 HOURS                           |
| ● EXPECTED LIFE FOR EACH RECORDER - 1,000 HOURS |          |                                       |

**SECTION 19**  
**RETURN BEAM VIDICON SYSTEM (RBV)**

SECTION 19  
RETURN BEAM VIDICON SYSTEM (RBV)

Ground scene information is viewed through three Return Beam Vidicon (RBV) Camera Sensors as they are simultaneously exposed. The RBV sensors convert the scene information in three unique spectral bands into low-level analog signals. The Camera Electronics convert this information into a video format that is fed to the Camera Controller Combiner (CCC), where the three camera videos are combined with sync, blanking, and timing signals and with coding information to produce a single composite video format. The Camera Controller Combiner controls the operating modes of the cameras and the generation of the composite video signal. The cameras may be commanded for single exposure, cyclic exposure, and calibration. The composite video signal is either stored on a Wideband Video Tape Recorder for later playback, or transmitted in real time through the spacecraft Wideband Telemetry Subsystem. An auxiliary video signal from each camera may also be applied directly to the Wideband Telemetry System without passing through CCC. See Figure 19-1 for functional block diagram, and Figure 19-2 for physical illustration. An equipment list is shown in Appendix A.

The RBV subsystem was launched in the mode shown in Table 19-1. Verification of this mode was obtained by telemetry early in Orbit 1 at Madrid and later by playback from Alaska.

INITIAL TURN-ON

The Return Beam Videcon Subsystem (RBV) was first turned ON in Orbit 40 for 1 minute and 2 seconds with Camera 1, but was turned OFF before shutter operated. WBVTR-1 was in record mode but received no data. All telemetry was nominal.

The RBV was turned on again in Orbit 41 on 25 January 1975 while over Greenbelt. The sequence of activities is shown in Table 19-2. Telemetry (Table 19-3), quick-look pictures, and the A-scope of the TR-70 all showed nominal sync pulses and video data.

## SUBSEQUENT OPERATIONS

The RBV was not operated again during this report period; therefore, no RBV scenes are available for processing.

Table 19-4 shows the pre-launch performance of the RBV.

Table 19-1. Return Beam Vidicon Subsystem Launch Mode

|               | MODE | CMD |
|---------------|------|-----|
| CALIBRATE     | EN   | 372 |
| APERTURE CORR | OUT  | 431 |
| EXPOSURE      | 4    | 454 |
| CYCLE         | CONT | 470 |
| CATH REACT    | OFF  | 371 |
| MAG COMP      | EN   | 677 |
| MAG COMP      | HI   | 753 |
| THER MOD 1    | EN   | 770 |
| THER MOD 2    | EN   | 730 |
| THER MOD 3    | EN   | 672 |
| RBV PWR       | OFF  | 731 |
| CCC           | OFF  | 432 |
| CAM 1         | OFF  | 511 |
| CAM 2         | OFF  | 510 |
| CAM 3         | OFF  | 512 |

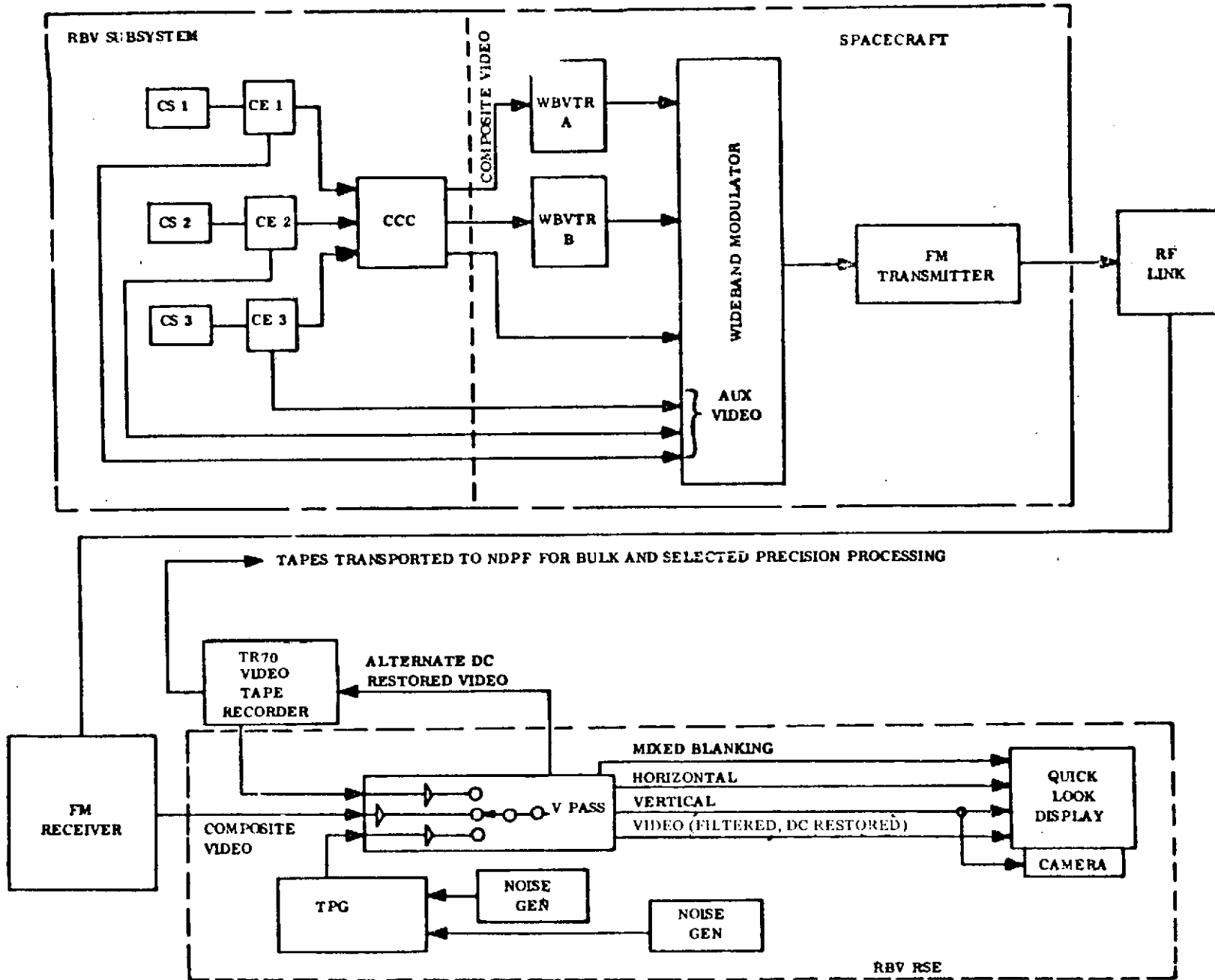


Figure 19-1. Return Beam Vidicon System Functional Block Diagram

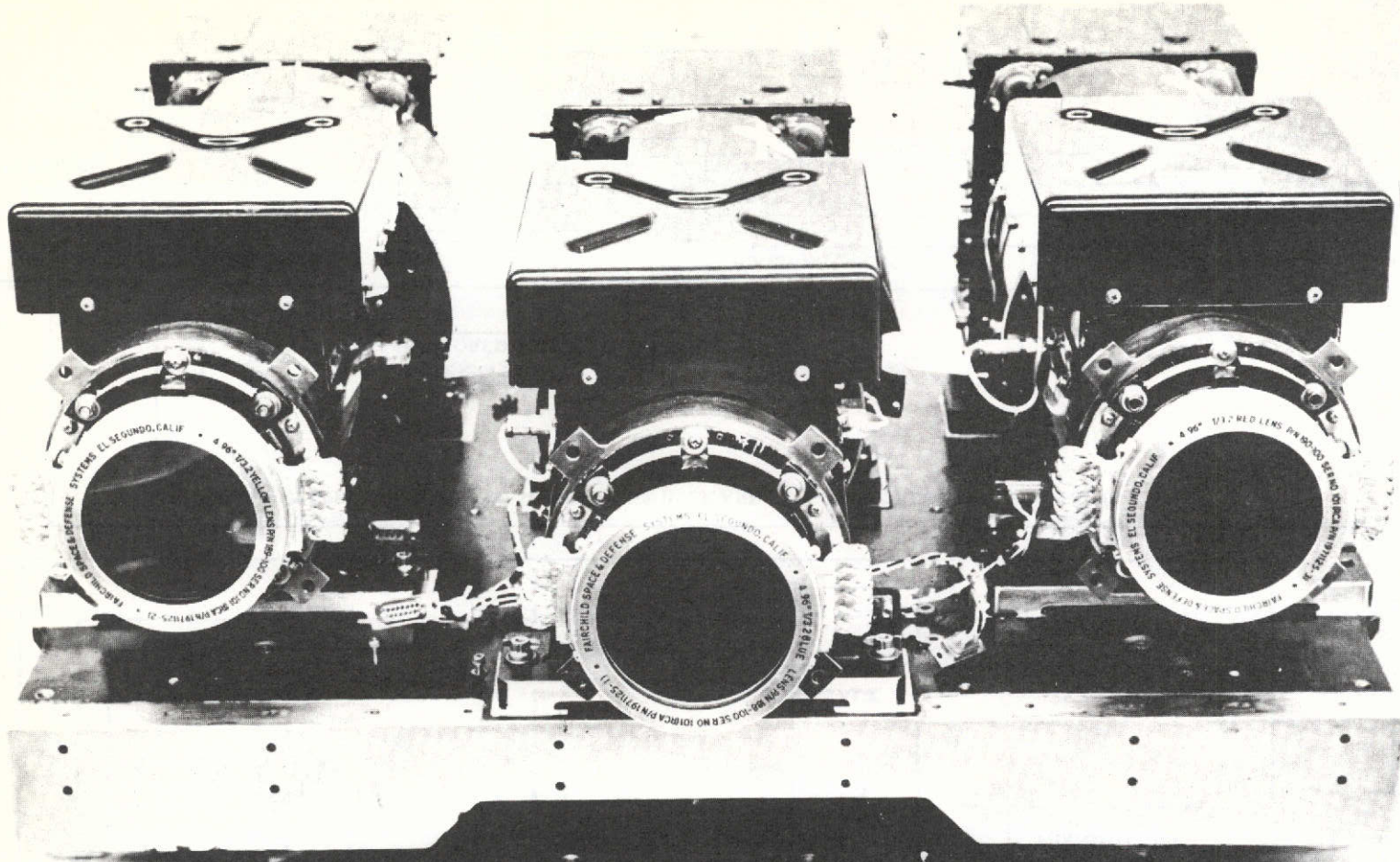


Figure 19-2. Return Beam Vidicom

Table 19-2. RBV Initial Turn-ON, Orbit 41, 25 January 1975

| Time     | Activity     |
|----------|--------------|
| 16:21:04 | WPA-1 ON     |
| 16:23:12 | WBR-1 RECORD |
| 16:23:59 | CAM 1 ON     |
| 16:24:00 | RBV ON       |
| 16:25:51 | RBV OFF      |
| 16:26:23 | CAM 1 OFF    |
| 16:27:59 | CAM 2 ON     |
| 16:28:31 | RBV ON       |
| 16:30:23 | RBV OFF      |
| 16:30:56 | CAM 2 OFF    |
| 16:34:01 | CAM 3 ON     |
| 16:34:07 | RBV ON       |
| 16:34:07 | RBV OFF      |
| 16:34:07 | CAM 3 OFF    |
| 16:34:07 | CAM 1 ON     |
| 16:34:07 | CAM 2 ON     |
| 16:34:07 | CAM 3 ON     |
| 16:34:07 | RBV ON       |
| 16:34:07 | WBR-1 OFF    |
| 16:34:07 | RBV OFF      |
| 16:34:07 | WPA-1 OFF    |



Table 19-3. RBV Telemetry Values

| Func. No. | Name                            | Telemetry Values |             |
|-----------|---------------------------------|------------------|-------------|
|           |                                 | T. V.<br>Norm    | Orbit<br>41 |
| 14001     | CCC Board Temp (DGC)            |                  | 19.939      |
| 14002     | CCC PWR Sup. Temp (DGC)         |                  | 21.047      |
| 14003     | 15V SUPPLY (TMV)                |                  | 3.950       |
| 14004     | +6V, -5.25 PWR. SUP (TMV)       |                  | 3.075       |
| 14100     | VIDEO OUTPUT VOLT (TMV)         | 0.96             |             |
| 14200     |                                 | 0.93             |             |
| 14300     |                                 | 1.06             |             |
| 14102     | COMBINED ALIGNMENT CUR (TMV)    | 3.75 to 4.02     | 3.950       |
| 14202     |                                 | 3.87 to 4.10     | 3.875       |
| 14302     |                                 | 3.80 to 4.05     | 3.850       |
| 14103     | TEMP. IN ELEC. UNIT (DGC)       |                  | 24.363      |
| 14203     |                                 |                  | 20.387      |
| 14303     |                                 |                  | 25.363      |
| 14104     | TEMP IN LV: PWR SUP (DGC)       |                  | 23.363      |
| 14204     |                                 |                  | 18.834      |
| 14304     |                                 |                  | 26.023      |
| 14105     | DEFL PWR SUP +10 (TMV)          | 3.92 to 4.07     | 3.950       |
| 14205     |                                 |                  | 3.950       |
| 14305     |                                 |                  | 4.000       |
| 14106     | L. V. PWR. Sup. +6 , -6.3 (TMV) | 3.65 to 3.80     | 3.700       |
| 14206     |                                 |                  | 3.650       |
| 14306     |                                 |                  | 3.725       |
| 14107     | Current in Ther. Elec (TMV)     | 2.53             | 2.650       |
| 14207     |                                 |                  | 2.500       |
| 14307     |                                 |                  | 2.575       |
| 14108     | Vidicon Fil. Cur. (TMV)         | 1.80 to 3.50     | 2.550       |
| 14208     |                                 |                  | 2.400       |
| 14308     |                                 |                  | 2.575       |
| 14111     | Target Volt. to Vidicon (TMV)   | 3.03             | 3.025       |
| 14211     |                                 |                  | 3.050       |
| 14311     |                                 |                  | 3.225       |
| 14120     | Vert. Defl. Volt. (TMV)         | 4.05             | 4.050       |
| 14220     |                                 |                  | 4.275       |
| 14320     |                                 |                  | 4.275       |
| 14114     | Temp Vidicon Face Plate (DGC)   | 21.99            | 21.997      |
| 14214     |                                 |                  | 21.059      |
| 14314     |                                 |                  | 22.398      |
| 14115     | Temp Focus Coil (DGC)           | 24.17            | 20.940      |
| 14215     |                                 |                  | 20.387      |
| 14315     |                                 |                  | 21.940      |

Table 19-4. Return Beam Vidicon Subsystem

| • COMPONENTS  |                                       |                               |      |           |  |        |        |        |        |
|---|---------------------------------------|-------------------------------|------|-----------|--|--------|--------|--------|--------|
|   |                                       | CAMERA CONTROLLER COMBINER    |      | S/N 003   |  |        |        |        |        |
|   |                                       | CAMERA ELECTRONICS 1 (BLUE)   |      | S/N 003   |  |        |        |        |        |
|   |                                       | CAMERA ELECTRONICS 2 (YELLOW) |      | S/N 002   |  |        |        |        |        |
|   |                                       | (REPLACED ON 8/19/74 WITH)    |      | S/N 004   |  |        |        |        |        |
|   |                                       | CAMERA ELECTRONICS 3 (RED)    |      | S/N 008   |  |        |        |        |        |
|   |                                       | CAMERA SENSOR 1 (BLUE)        |      | S/N 003   |  |        |        |        |        |
|   |                                       | CAMERA SENSOR 2 (YELLOW)      |      | S/N 002   |  |        |        |        |        |
|   |                                       | (REPLACED ON 8/19/74 WITH)    |      | S/N 004   |  |        |        |        |        |
|   |                                       | CAMERA SENSOR 3 (RED)         |      | S/N 008   |  |        |        |        |        |
|   |                                       | RBV MAGNET MOMENT ASSEMBLY    |      | S/N 49513 |  |        |        |        |        |
| • PRE-LAUNCH PERFORMANCE  |                                       |                               |      |           |  |        |        |        |        |
| ALL EVALUATION PARAMETERS ARE SATISFACTORY.   |                                       |                               |      |           |  |        |        |        |        |
| PRE-LAUNCH PERFORMANCE SUMMARY  |                                       |                               |      |           |  |        |        |        |        |
|   | (SPEC)                                |                               |      | (RCA)     |  |        | (GE)   |        |        |
|   | BLUE                                  | YELLOW                        | RED  | BLUE      | YELLOW   | RED    | BLUE   | YELLOW | RED    |
| • SIGNAL/NOISE (A. C. OUT)  | 33DB                                  | 33DB                          | 23DB | 34.1DB    | 37.3DB   | 30.8DB | 34.3DB | 35.2DB | 30.6DB |
| • RADIANCE OUTPUT   |                                       |                               |      |           |  |        |        |        |        |
| A) REPEATABILITY OF INTERNAL CALIBRATION LEVELS   |                                       |                               |      |           |  |        |        |        |        |
| CAL 0   | REPEATABILITY WITHIN                  |                               |      | .270      | .244   | .343   | .274   | .238   | .330   |
| CAL 1   | 50 MV (CAMERA TEMPERATURE A CONSTANT) |                               |      | .450      | .586   | .441   | .462   | .580   | .439   |
| CAL 2   |                                       |                               |      | .938      | 1.086  | .869   | .936   | 1.052  | .864   |
| B) WHITE SHADING-% (CENTER)   | 15                                    | 15                            | 15   | 16        | 19.1   | 15.3   | 17.4   | 11.0   | 13.5   |
| • RASTER SIZE   |                                       |                               |      |           |  |        |        |        |        |
| HORIZONTAL %  | REPEATABILITY                         |                               |      | 100.08    | 100.00   | 100.26 | 100.04 | 100.14 | 100.56 |
| VERTICAL %  |                                       |                               |      | 100.28    | 100.16   | 100.78 | 100.24 | 100.26 | 100.76 |
| • VERTICAL RESOLUTION (CENT. 59 LP) %   | REPEATABILITY                         |                               |      | 30        | 31   | 32     | 34     | 38     | 35     |
| • HORIZONTAL RESOLUTION (CENT. 59 LP) %   | REPEATABILITY                         |                               |      | 26        | 26   | 32     | 27     | 31     | 43     |
| PROBLEM   |                                       |                               |      |           | RESOLUTION   |        |        |        |        |
| <ul style="list-style-type: none"> <li>• HORIZONTAL CENTERING SHIFT                             <ul style="list-style-type: none"> <li>- RED CAMERA - 6 TIMES AT GE (5/20/74 AND DURING AUGUST AND SEPT. 1974, EBPR 302, MR D08197.)</li> <li>- BLUE CAMERA - ONCE AT RCA</li> <li>- YELLOW CAMERA, S/N 004, 3 TIMES AT RCA</li> <li>- YELLOW CAMERA, S/N 002, SHIFT NEVER OBSERVED.</li> </ul> </li> <li>• LOSS OF VIDEO FROM BLUE AND YELLOW CAMERAS DURING THERMAL VACUUM TEST. HIGH VOLTAGE TRANSFORMER FAILED IN BOTH CAMERAS. (6/1/74 AND 6/5/74, EBPR 310, MR D08200 AND EBPR 342, MR D08190.)</li> <li>• CAL 2 LEVEL OF YELLOW CAMERA IS SATURATED AND THEREFORE UNUSEABLE (8/21/74, EBPR 404, MR 08266).</li> <li>• VERTICAL PORTION OF RESEAU MARKS MISSING ON CAL 2 OF YELLOW CAMERA. (9/5/74, EBPR 446).</li> <li>• HORIZONTAL JITTER IN RED CAMERA ANCHOR MARK; ANCHOR MARK ALSO NOT VERTICAL. (9/6/74, EBPR 461).</li> <li>• MULTILINE JUMP DURING YELLOW CAMERA OPERATION (9/7/74, EBPR 466).</li> </ul> |                                       |                               |      |           | <ul style="list-style-type: none"> <li>• UNABLE TO ISOLATE PROBLEM THROUGH EXTENSIVE TESTING AT RCA AND GE SHIFT OBSERVED IN <math>\approx</math> 1% OF DATA, SHIFT HAS NOT OCCURRED SINCE T/V ORBIT D-10, 9/7/74, ACCEPT AS IS.</li> <li>• HIGH VOLTAGE TRANSFORMER REDESIGNED, TRANSFORMERS REPLACED IN ALL CAMERAS.</li> <li>• ACCEPT AS IS. USE CAL 1 LEVEL FOR INFLIGHT CALIBRATION CHECK.</li> <li>• CAUSED BY AMPLIFIER SATURATION. CAMERA PERFORMANCE IS NOT DEGRADED. ACCEPT AS IS.</li> <li>• SUSPECT JITTER RELATED TO HORIZONTAL PROBLEMS.</li> <li>• ANCHOR MARK WAS NOT ETCHED VERTICALLY ON TUBE. ACCEPT AS IS.</li> <li>• ONE TIME ONLY OCCURRENCE. ACCEPT AS IS.</li> </ul> |        |        |        |        |

SECTION 20

MULTISPECTRAL SCANNER SUBSYSTEM

SECTION 20  
MULTISPECTRAL SCANNER SUBSYSTEM

The Multispectral Scanner (MSS) system consists of spacecraft and ground equipment which permits images of the earth to be obtained simultaneously in 4 or 5 spectral bands. The LANDSAT-2 MSS uses a 4-band scanner operating in the solar reflected spectral region from 0.5 to 1.1 micrometers (microns) wave length, and scans cross track swaths of 0.5 km width (at a 496-nm altitude), imaging six scan lines across in each of the four spectral bands simultaneously. The object plane is scanned by means of an oscillating flat mirror between the scene and the double reflector telescope optical chain. The 11.56 degree cross-track field-of-view is scanned as the mirror oscillates approximately  $\pm 2.89$  degrees 13.62 times per second about its nominal position as shown in Figure 20-1.

The instantaneous field-of-view of each detector subtends an earth-area square of 256 feet on a side from the nominal orbit altitude. Field stops are formed for each line imaged during a scan, and for each spectral band, by the square input end of an optical fiber. Six of these fibers in each of four bands are arranged in a 4 x 6 matrix in the focal plane of the telescope. See Figure 20-2 for functional block diagram, and Figure 20-3 for pictorial view. An equipment list is shown in Appendix A.

The Multispectral Scanner (MSS) was launched in the OFF mode, except that the Rotating Shutter was commanded ON to distribute the launch mode stresses around the bearing. The complete launch configuration is shown in Table 20-1. Verification of this configuration was obtained from telemetry in Orbit 1 at Madrid, and by playback from Orbit 1 at Alaska.

In Orbit 1 at Alaska, the rotating shutter (and the enabling primary power switch for MSS) was commanded OFF at 19:29:45.

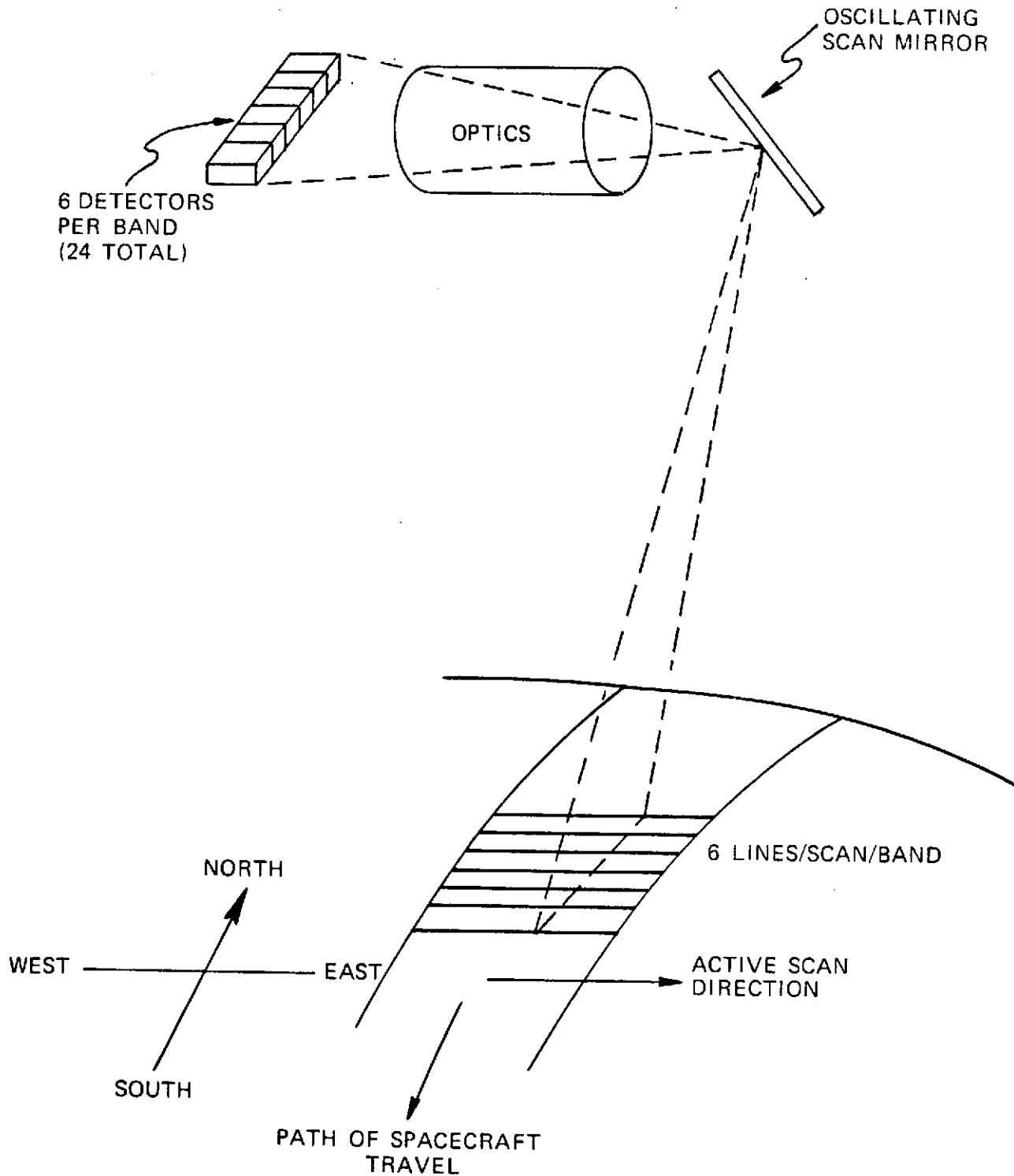


Figure 20-1. MSS Scanning Arrangement

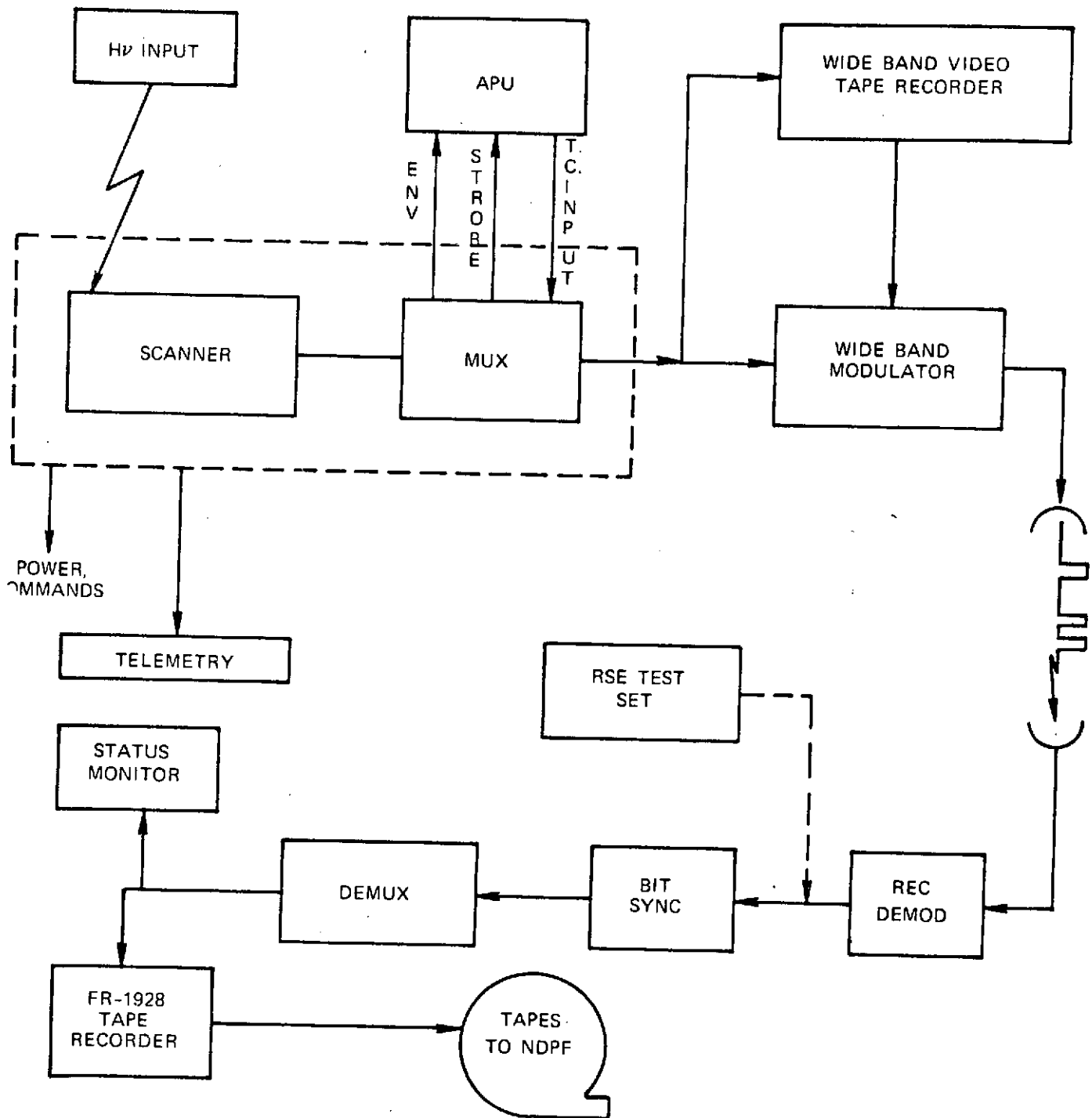


Figure 20-2. Simplified Functions Block Diagram of the Overall MSS System

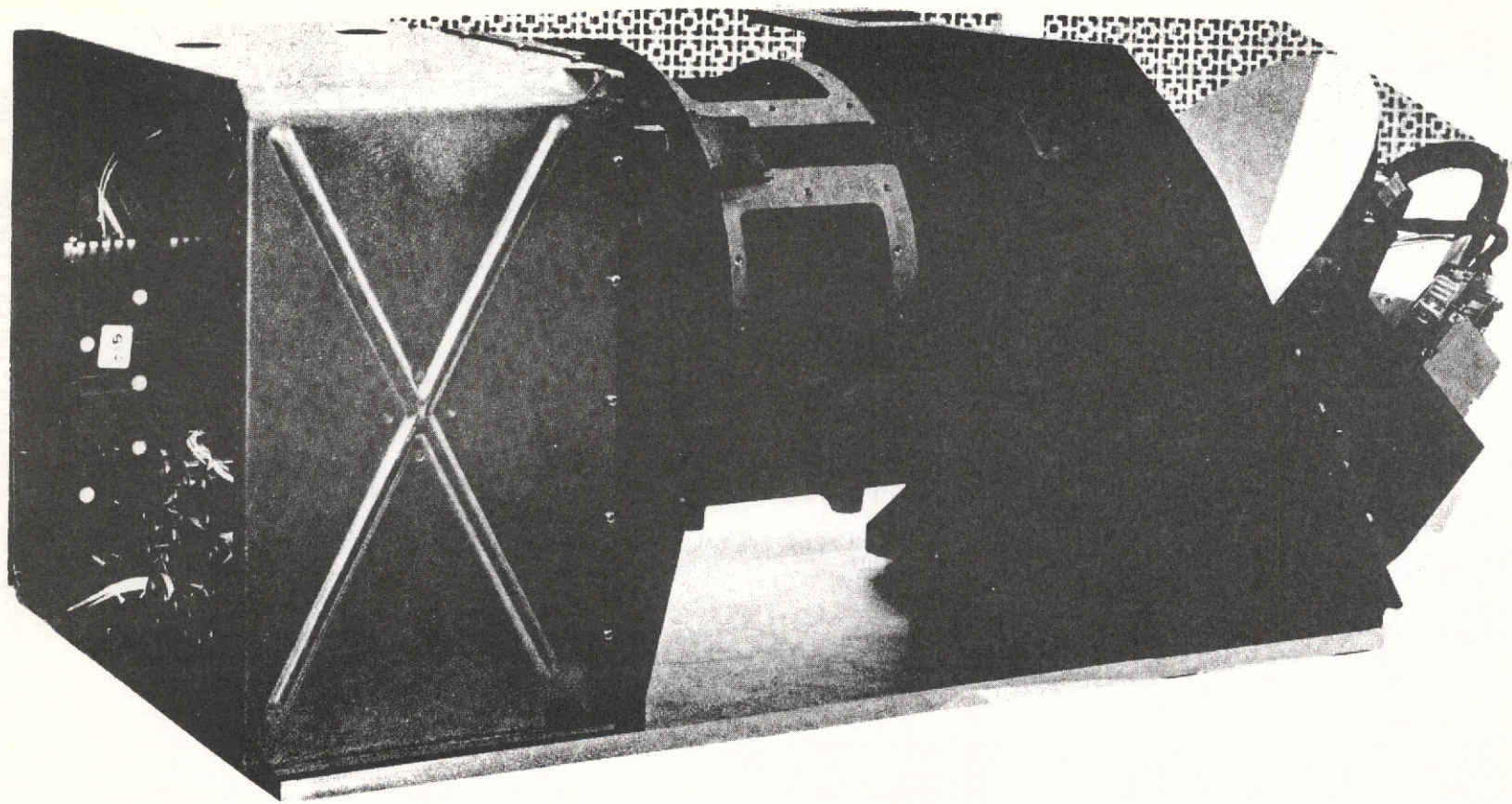


Figure 20-3. Multispectral Scanner

Table 20-1. Multispectral Scanner Subsystem Launch Mode

|              | Mode | Cmd |
|--------------|------|-----|
| MSS BOTH     | EN   | 632 |
| SYSTEM PWR   | ON   | 052 |
| HIGH VOLT    | OFF  | 073 |
| SEL INV      | A    | 053 |
| BAND 1       | OFF  | 076 |
| BAND 2       | OFF  | 132 |
| BAND 3       | OFF  | 135 |
| BAND 1 HV    | A    | 054 |
| BAND 2 HV    | A    | 055 |
| BAND 3 HV    | A    | 056 |
| BAND 1 HV    | OFF  | 176 |
| BAND 2 HV    | OFF  | 233 |
| BAND 3 HV    | OFF  | 232 |
| SHUTTER      | A    | 214 |
| ROT SHUTTER  | ON   | 152 |
| CAL LAMP     | A    | 117 |
| CAL LAMP     | OFF  | 177 |
| SCAN PWR     | 1    | 217 |
| SCAN MON     | OFF  | 172 |
| SCAN MON     | A    | 255 |
| SCAN MIRROR  | INH  | 256 |
| SCAN MIR PWR | 1    | 312 |
| MIR SCAN     | OFF  | 335 |
| MUX          | INH  | 276 |
| MUX MODE     | COMP | 315 |
| HEATER       | OFF  | 735 |
| SYS ON/OFF   | NORM | 316 |
| BAND 1 GAIN  | LO   | 175 |
| BAND 2 GAIN  | LO   | 174 |

INITIAL TURN-ON

The initial turn-on of the MSS subsystem was in Orbit 19 during a Merritt Island/Green-belt/Alaska pass. The commands and execution times are shown in Table 20-2.

The WBPA-2 was turned on by stored command at 02:00:16.

Telemetry values, video and strip charts were normal.



Table 20-2. MSS Initial Turn-On Orbit 19, 24 January 1975

| Cmd                       | Activity         | Time |    |    |
|---------------------------|------------------|------|----|----|
|                           |                  | H    | M  | S  |
| <u>VIA MERRITT ISLAND</u> |                  |      |    |    |
| 775                       | USB ON           | 01   | 57 | 14 |
| 316                       | MSS ON NORM      | 01   | 59 | 57 |
| 316                       | MSS ON NORM      | 02   | 01 | 29 |
| 650                       | WBR-2 ON         | 02   | 01 | 59 |
| 572                       | WBR-2 STBY       | 02   | 02 | 03 |
| 513                       | WBR-2 REC        | 02   | 02 | 16 |
| 156                       | CAL LAMP ON      | 02   | 02 | 24 |
| 153                       | SCAN MON ON      | 02   | 02 | 34 |
| 277                       | SCAN MIR NORM    | 02   | 02 | 44 |
| 314                       | MID SCAN CODE ON | 02   | 02 | 55 |
| 610                       | MSS ENABLE       | 02   | 03 | 05 |
| 257                       | MUX NORM         | 02   | 07 | 26 |
| 052                       | MSS SYS ON       | 02   | 07 | 33 |
| 212                       | BN 2 HV ON       | 02   | 07 | 51 |
| 233                       | BN 2 HV OFF      | 02   | 08 | 04 |
| 132                       | BN 2 OFF         | 02   | 08 | 17 |
| 114                       | BN 3 ON          | 02   | 08 | 45 |
| 112                       | MSS HV ON        | 02   | 08 | 58 |
| 213                       | BN 3 HV ON       | 02   | 09 | 09 |
| <u>VIA GREENBELT</u>      |                  |      |    |    |
| 057                       | BN 1 ON          | 02   | 10 | 26 |
| 157                       | BN 1 HV ON       | 02   | 10 | 40 |
| 113                       | BN 2 ON          | 02   | 10 | 48 |
| 212                       | BN 2 HV ON       | 02   | 10 | 57 |
| <u>VIA ALASKA</u>         |                  |      |    |    |
| 073                       | MSS SYS OFF      | 02   | 14 | 47 |
| 766                       | PYLDS OFF        | 02   | 15 | 10 |
| 067                       | WBPA-2 OFF       | 02   | 15 | 23 |
| 757                       | USB OFF          | 02   | 22 | 54 |

## SUBSEQUENT OPERATIONS

In Orbit 21 a sun calibration was performed while over Alaska. Configuration was prime, compressed, low, with mid-scan code ON. The results as reported by Alaska are shown in Table 20-3.

Table 20-3. MSS Sun Calibration in Orbit 21 Reported by ALASKA

|                               |  |                             |
|-------------------------------|--|-----------------------------|
| START TIME OF SUN CAL PULSE   |  | 05:47:02                    |
| DELAY TIME FROM LINE ST. (MS) |  | 18                          |
| PEAK AMPLITUDE                |  |                             |
|                               |  | VOLTS<br>(on 4V FULL SCALE) |
| 1                             |  | 3.0                         |
| 2                             |  | 3.1                         |
| 5                             |  | 3.1                         |
| 7                             |  | 3.6                         |
| 8                             |  | 3.5                         |
| 12                            |  | 3.3                         |
| 13                            |  | 3.0                         |
| 15                            |  | 3.2                         |
| 18                            |  | 3.2                         |
| 19                            |  | 2.2                         |
| 20                            |  | 2.1                         |
| 23                            |  | 2.2                         |

The MSS was also operated in Orbits 27, 28 and 42 in realtime operations; and in Orbit 40 to Record on WBR-1. A second sun calibration was made in Orbit 47 with results similar to those of Orbit 21.

Typical telemetry values are shown in Table 20-4. Table 20-5 shows the pre-launch performance of the MSS.

In Appendix E the same MSS scene is shown in 5 successive figures, F-1 thru F-5, one for each of the four bands, and the final one a composite of 3 bands

Table 20-4. MSS Telemetry

| Function | Name                             | *<br>T. V.<br>Norm | Orbits |
|----------|----------------------------------|--------------------|--------|
|          |                                  |                    | 27     |
| 15040    | MUX -6 VDC (TMV)                 | 3.92               | 4.05   |
| 15041    | A/D SUPPLY (TMV)                 | 5.74               | 5.95   |
| 42       | AVERAGE DENSITY (TMV)            | 1.72               | 1.71   |
| 43       | FIBER OPTICS PLATE 1 TEMP (DGC)  | 22.30              | 18.13  |
| 44       | FIBER OPTICS PLATE 2 TEMP (DGC)  | 22.30              | 17.87  |
| 45       | MUX TEMP (DGC)                   | 25.59              | 23.38  |
| 46       | ELEC COVER TEMP (DGC)            | 23.09              | 20.25  |
| 47       | PWR. SUP. TEMP. (DGC)            | 23.85              | 19.45  |
| 48       | SCAN MIR REG. TEMP (DGC)         | 23.44              | 18.30  |
| 49       | SCAN MIR DRIVE ELEC. TEMP. (DGC) | 24.34              | 18.96  |
| 15150    | SCAN MIR DRIVE COVER TEMP (DGC)  | 22.50              | 17.26  |
| 51       | SCAN MIR TEMP (DGC)              | 21.87              | 17.26  |
| 52       | ROT. SHUT HOUSING TEMP (DGC)     | 22.58              | 23.26  |
| 53       | SCAN MIR REG VOLT (TMV)          | 4.56               | 4.7    |
| 54       | CAL LAMP CURRENT (TMV)           | 1.18               | 1.17   |
| 55       | BAND 1 15 VDC (TMV)              | 4.97               | 4.98   |
| 56       | BAND 2 15 VDC (TMV)              | 5.00               | 5.00   |
| 57       | BAND 3 15 VDC (TMV)              | 4.88               | 4.95   |
| 58       | BAND 4 15 VDC (TMV)              | 4.83               | 5.00   |
| 59       | TLM 15 VDC (TMV)                 | 5.04               | 5.06   |
| 15060    | +12 VDC +6 VDC (TMV)             | 4.92               | 5.03   |
| 61       | LOGIC +5 VDC (TMV)               | 4.86               | 4.81   |
| 62       | RECT. +19 VDC (TMV)              | 4.97               | 5.03   |
| 63       | RECT. -19 VDC (TMV)              | 3.54               | 3.60   |
| 64       | BAND 1 HVA (TMV)                 | 4.95               | 4.95   |
| 65       | BAND 1 HVB (TMV)                 | 5.03               | OFF    |
| 66       | BAND 2 HVA (TMV)                 | 4.72               | 4.70   |
| 67       | BAND 2 HVB (TMV)                 | 4.70               | OFF    |
| 68       | BAND 3 HVA (TMV)                 | 4.75               | 4.72   |
| 69       | BAND 3 HVB (TMV)                 | 4.65               | OFF    |
| 15070    | SHUT MOT. CONTR. INTEG (TMV)     | 2.49               | 2.60   |
| 15071    | SCAN MIRROR DRIVE CLOCK (TMV)    | 1.93               | 2.00   |

\*Thermal Vacuum Test Data at 20°C.

Table 20-5. Multispectral Scanner

COMPONENT SUMMARY

- SCANNER S/N-2
- MUX S/N-1
- LINE FILTER S/N-4

PRE-LAUNCH PERFORMANCE SUMMARY

| <u>PARAMETER</u>        | <u>SPEC</u>                        | <u>PRE-LAUNCH MEASUREMENT</u>   |                              |
|-------------------------|------------------------------------|---|------------------------------|
|                         |                                    | <u>LIN</u>  | <u>COMP</u>                  |
| ● SIGNAL/NOISE          | B1 90                              | MEAN 109.6  | 108.8 WORST CASE S1, CL 80.2 |
|                         | B2 69                              | MEAN 96.6   | 82.5 WORST CASE S10, CL 69.1 |
|                         | B3 45                              | MEAN 72.9   | 66.6 WORST CASE S14, CL 59.4 |
|                         | B4 104                             | MEAN 133.0  | - WORST CASE S20, LL 108.0   |
| ● HORIZONTAL MTF        | > 33%<br>(SWR)                     | ALL CHANNELS > 39%  |                              |
| ● CROSS AXIS JITTER     | <u>+30</u> μRAD                    | MEAN = 1.1 μRAD MAX = 5.2 μRAD  |                              |
| ● SCAN SYMMETRY         |                                    | 0.4990 (NO. WORDS TO MSC/TOTAL LINE LENGTH)   |                              |
| ● LINE LENGTH VARIATION | <u>+2</u> WORDS<br>LINE TO<br>LINE | MAX <u>+2</u> WORDS OVER 35 MINUTES<br>9 WORDS OVER 18°C CHANGE<br>MEAN = 3247 @ 23°C |                              |

Table 20-5. Multispectral Scanner (Cont'd)

| <u>PARAMETER</u>  | <u>SPEC</u>    |              | <u>PRE-LAUNCH MEASUREMENT</u>                       |                  |                  |      |                  |      |
|---|----------------|--------------|---|------------------|------------------|------|------------------|------|
|   |                |              | 2% VARIATION OVER 17 MINUTES AFTER 3 MINUTE WARMUP. |                  |                  |      |                  |      |
|   | <u>NOMINAL</u> |              |   | <u>MEAN</u>      | <u>MAX (SEN)</u> |      | <u>MIN (SEN)</u> |      |
| • VIDEO STABILITY   |                |              |   |                  |                  |      |                  |      |
| • GAIN (22°C, COMP LO)<br>(QL/MW CM <sup>-2</sup> STEAR. <sup>-1</sup><br>(VACUUM)) | B1             | 25.80        | B1  | 26.14            | 26.97            | (6)  | 25.07            | (1)  |
|   | B2             | 32.00        | B2  | 34.39            | 35.91            | (10) | 32.64            | (12) |
|   | B3             | 36.36        | B3  | 38.45            | 39.96            | (18) | 36.10            | (13) |
|   | B4             | 13.91        | B4  | 13.10            | 13.34            | (24) | 12.62            | (22) |
| • OFFSET (22°C, COMP LO)<br>QUANTUM LEVEL (FULL<br>RANGE - 64 QL'S)                 |                | >0           | B1  | +1.00            | +1.38            | (5)  | +0.73            | (3)  |
|   |                | <0.8         | B2  | +0.79            | +1.03            | (12) | +0.52            | (7)  |
|   |                | (LINEAR MODE | B3  | +0.75            | +1.01            | (17) | +0.35            | (14) |
|   |                | IN SPEC.)    | B4  | +0.82            | +1.28            | (23) | +0.43            | (22) |
| • TEMP. SENSITIVITY<br>(10 TO 35°C)   |                |              |   | % GAIN CHANGE/°C |                  |      |                  |      |
|   |                |              | B1  | -0.21%           | -0.32%           | (1)  | -0.06%           | (4)  |
|   |                |              | B2  | -0.35%           | -0.39%           | (8)  | -0.22%           | (10) |
|   |                |              | B3  | -0.43%           | -0.49%           | (18) | -0.22%           | (13) |
|   |                |              | B4  | +0.30%           | +0.35%           | (21) | +0.029%          | (23) |

Table 20-5. Multispectral Sensor (Cont'd)

| <u>PARAMETER</u>   | <u>SPEC</u>          | <u>PRE-LAUNCH MEASUREMENT</u>    |                                  |  |                                  |
|--|----------------------|----------------------------------|----------------------------------|--|----------------------------------|
|  |                      | <u>LAMP A</u>                    |                                  | <u>LAMP B</u>                                |                                  |
|  |                      | <u>UNCOR</u>                     | <u>COR</u>                       | <u>UNCOR</u>                                 | <u>COR</u>                       |
| ● TEMP REPEATABILITY<br>(10°C TO 35°C)   |                      | ALL BANDS + 2.0%                 |                                  |  |                                  |
| ● CAL WEDGE CORRECTION<br>WITH TEMP. (10°C TO 35°C)<br>% CHANGE/°C<br>(MEAN VALUES)  | B1<br>B2<br>B3<br>B4 | -.286<br>-.405<br>-.469<br>+.399 | -.098<br>-.062<br>-.054<br>+.111 | -.254<br>-.370<br>-.459<br>+.366             | -.038<br>-.052<br>-.027<br>+.082 |
| ● VIDEO SENSITIVITY TO HOVIS<br>SPHERE TARGET (NORMALIZED<br>TO FULL SCALE) % GAIN CHANGE<br>OVER A ZERO RADIANCE INPUT<br>COMPUTED FROM CAL WEDGE | B1<br>B2<br>B3<br>B4 | +4.3%<br>+4.2%<br>+2.8%<br>-0.1% |                                  | S3, +6%<br>S8, +6%<br>S18, +5%<br>S24, +0.5% |                                  |

Table 20-5. Multispectral Sensor (Cont'd)  
 PRE-LAUNCH MSS RADIOMETRIC CALIBRATION

## THREE CALIBRATIONS

- POST INTEGRATION (5/74)
- POST TV II (9/74)
- POST VIBRATION (10/74)

|                              | <u>POST INTEGRATION</u>                               |   |
|------------------------------|---|---|
|                              | <u>POST TV 11</u>                                     | <u>POST VIBRATION</u>                                 |
| REPEATABILITY<br>(CORRECTED) | BANDS 1-3 $-0.8 \pm 0.6\%$<br>BAND 4 $+0.2 \pm 0.5\%$ | BANDS 1-3 $-1.5 \pm 0.8\%$<br>BAND 4 $-1.0 \pm 0.4\%$ |
| REPEATABILITY<br>(CORRECTED) | BANDS 1-3 $+3.3 \pm 1\%*$<br>BAND 4 $-3.4 \pm 0.5\%$  | BANDS 1-3 $-1.4 \pm 0.8%*$<br>BAND 4 $-2.6 \pm 0.5\%$ |

\*SENSOR 8 = +6.2%, +3.7%  
 SENSOR 10 = +6.8%, +4.2%

Table 20-5. Multispectral Sensor (Cont'd)

PRE-LAUNCH PROBLEM SUMMARY

|          | <u>PROBLEM</u>   | <u>RESOLUTION</u>   |
|----------|--|---|
| V/T I    | <ul style="list-style-type: none"> <li>● VIDEO (0.5 MSEC) OCCURS PROCEEDING PREAMBLE, CAUSES DEMUX TO MISS LINE START OR FIND FALSE LINE START. EBPR 306.</li> </ul> | <ul style="list-style-type: none"> <li>● REPHASE SHUTTER SUCH THAT SHUTTER OPENS DURING PREAMBLE. PROBLEM DID NOT APPEAR IN V/T II.</li> </ul>  |
| V/T I    | <ul style="list-style-type: none"> <li>● SCAN MONITOR A AND B OUT OF ALIGNMENT BELOW 20°C. EBPR 293, MR D08191, MR D08199.</li> </ul>                                | <ul style="list-style-type: none"> <li>● RE-ALIGN SCAN MONITORS, PROBLEM DID NOT APPEAR IN V/T II.</li> </ul>   |
| V/T      | <ul style="list-style-type: none"> <li>● APPARENT GAIN CHANGE IN CAL WEDGE FROM AMBIENT TO VACUUM.<br/>B1 - 13%<br/>B2 - 3%<br/>B3 - 7%<br/>B4 + 11%</li> </ul>      | <ul style="list-style-type: none"> <li>● PROBLEM REPEATABLE, WAS OBSERVED AT HAC, EXTERNAL TARGET REMAINED CONSTANT. CALIBRATION IS STABLE AND REPEATABLE IN VACUUM. ACCEPT AS IS.</li> </ul> |
| POST VIB | <ul style="list-style-type: none"> <li>● SUN CAL MIRROR ALIGNMENT OFF 2° IN AZIMUTH FROM HAC DATA. EBPR 535, D07204.</li> </ul>                                      | <ul style="list-style-type: none"> <li>● ACCEPT AS IS. INSPECTION REVEALED THAT MIRROR WAS FIRMLY IN PLACE. NO APPARENT MOVEMENT.</li> </ul>  |



**SECTION 21**  
**DATA COLLECTION SUBSYSTEM (DCS)**

## SECTION 21

### DATA COLLECTION SUBSYSTEM (DCS)

The Data Collection System is designed to relay data from randomly distributed Data Collection Platforms (DCP) through the LANDSAT-2 spacecraft to either receiving sites, Greenbelt, Md. or Goldstone, Calif. The DCS system is designed to collect and provide at least one message from each of up to 1000 Data Collection Platforms in the continental United States every 12 hours, with a probability of 0.95, with a nominal LANDSAT S/C orbit and both ground stations operating. See Figure 21-1 for system description, Figure 21-2 for functional block diagram, and Figure 21-3 for pictorial view. See Appendix A for hardware listing.

The Data Collection System was launched in the mode shown in Table 21-1. Verification of this mode was obtained by CRT displays and strip charts from telemetry received from Madrid and playback from Alaska early in Orbit 1. About 100 DCS ground station platforms were operational at launch time.

#### INITIAL-TURN-ON

DCS Receiver No. 1 was turned ON at 02:02:08 in Orbit 5, and has been left ON since. The equipment operated normally. Telemetry values are shown in Table 21-2.

Table 21-1. Data Collection System Launch Mode

|            | Mode | CMD |
|------------|------|-----|
| Receiver 1 | OFF  | 407 |
| Receiver 2 | OFF  | 406 |

In Orbit 6, the first complete orbit after turn-on, 348 messages were received, most of them simultaneously at Greenbelt and Goldstone.

#### SUBSEQUENT OPERATIONS

Overall performance of the Data Collection System during the remaining orbits has been well within the system design. PIR-U-1N23-ERTS-130 in Appendix F demonstrates that effectiveness of the DCS with LANDSAT-2 is at least as high as that with LANDSAT-1. An average of over 5 messages are being received from each platform each 12 hours.

Table 21-2. DCS Telemetry Values

| Func. No. | Name                            | * 20°C Plateau | Orbits  |         |         |         |         |
|-----------|---------------------------------|----------------|---------|---------|---------|---------|---------|
|           |                                 |                | 5       | 15      | 25      | 36      | 49      |
| 16001     | Receiver 1 Sig Strength (DBM)** | -199           | -123.34 | -122.71 | -123.40 | -121.66 | -124.35 |
| 16002     | Receiver 1 Temp (DGC)           | 23.4           | 22.54   | 24.02   | 24.42   | 24.40   | 24.45   |
| 16003     | Rec-1 Pwr Input Volt (VDC)      | 2.37           | 2.35    | 2.37    | 2.37    | 2.37    | 2.37    |
| 16004     | Receiver 2 Sig Volt (DBM)       | -119           | F       | F       | F       | F       | F       |
| 16005     | Receiver 2 Temp (DGC)           | 22.3           | F       | F       | F       | F       | F       |
| 16006     | Receiver 2 Input Volt (VDC)     | 2.35           | F       | F       | F       | F       | F       |

\*Thermal Vacuum Test Data

\*\*This value is for a CW carrier only; it is not valid during DCS message reception.

F=Receiver 2 was OFF

Table 21-3 describes pre-launch subsystem performance.

Table 21-3. DCS Subsystem

|  |  |                        |                        |                                      |
|--|--|------------------------|------------------------|--------------------------------------|
| ● <u>Component</u>                                 |  |                        |                        |                                      |
| Receiver A   | S/N EAB-FT-2                             |                        |                        |                                      |
| Receiver B   | S/N EAB-FT-3                             |                        |                        |                                      |
| ● <u>Pre-Launch Performance</u>                    |  |                        |                        |                                      |
| DCS  |  |                        |                        |                                      |
| <u>Performance</u>                                 | <u>Level</u>                             | <u>Receiver No. 1</u>  | <u>Receiver No. 2</u>  | <u>Spec</u>                          |
| Dynamic Range                                      | -70 to -121 DBM<br>input signal strength | 2.0 PP                 | 2.0 PP                 | 2.0 ± 0.2 PP                         |
| Translation Frequency                              | F up -F down                             | 400.525 MHz            | 400.524 MHz            | 400.526 ± .006 MHz                   |
| Miss Rate  | -119 DBM                                 | 0.7 x 10 <sup>-2</sup> | 1.3 x 10 <sup>-2</sup> | < 5 x 10 <sup>-2</sup><br>@ -117 DBM |
| Error Rate   | -119 DBM                                 | < 10 <sup>-5</sup>     | < 10 <sup>-5</sup>     | < 10 <sup>-3</sup><br>@ -117 DBM     |
| ● <u>Pre-Launch Problem Summary</u>                |  |                        |                        |                                      |
| No problems throughout environmental test program. |  |                        |                        |                                      |

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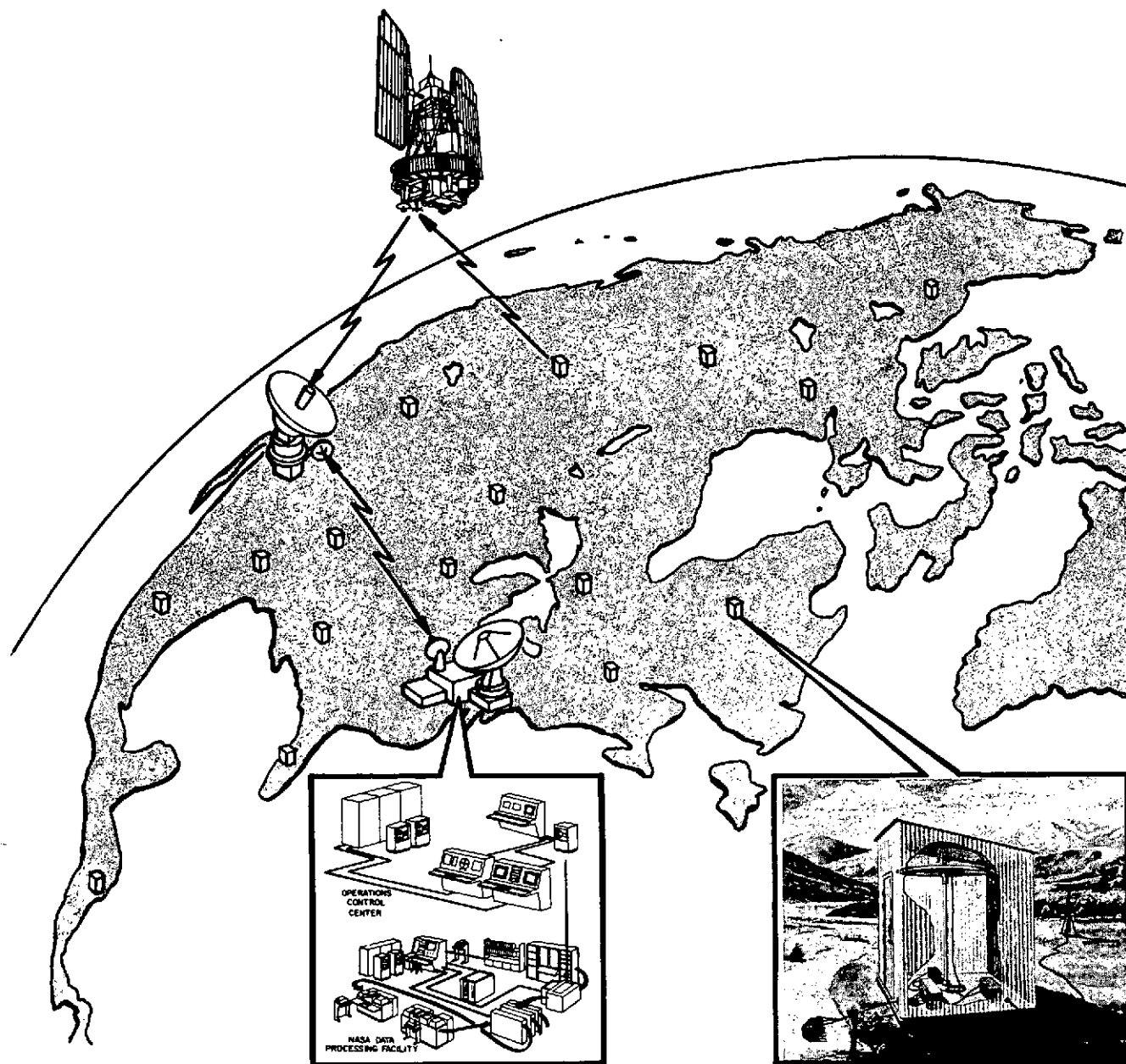


Figure 21-1. LANDSAT-2 Data Collection System

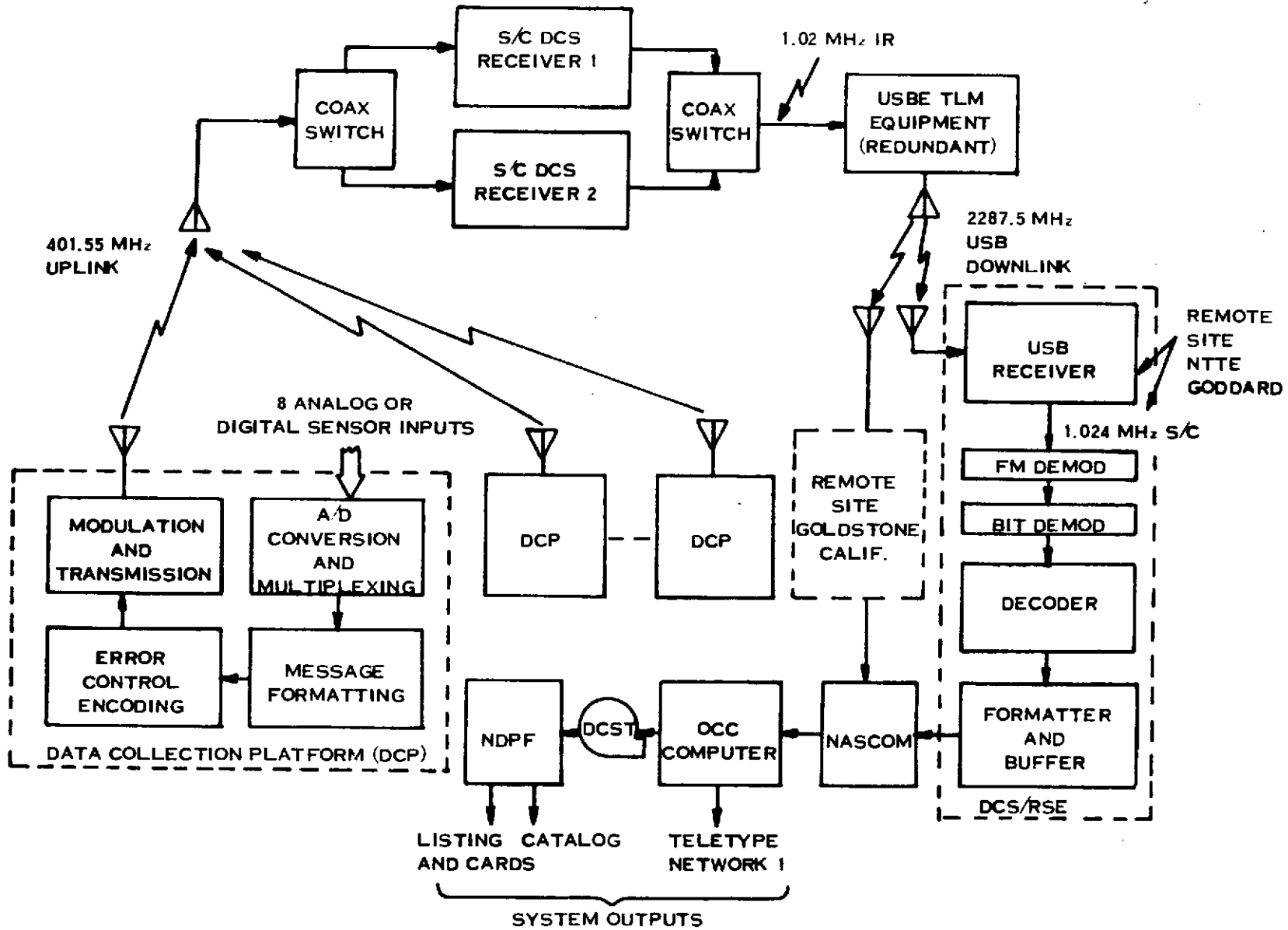
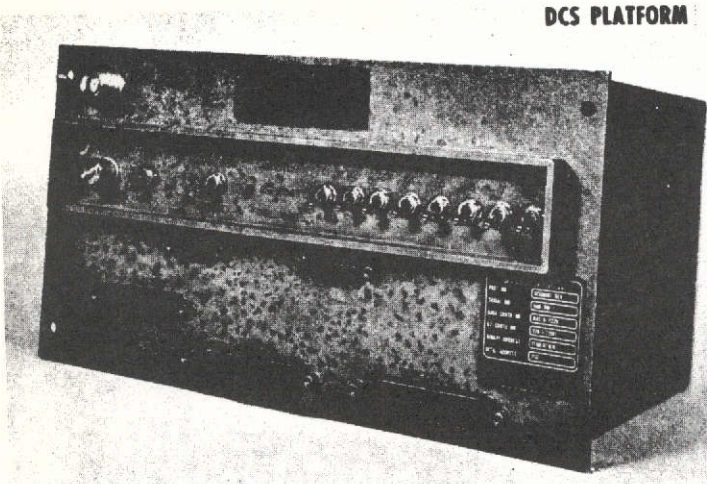
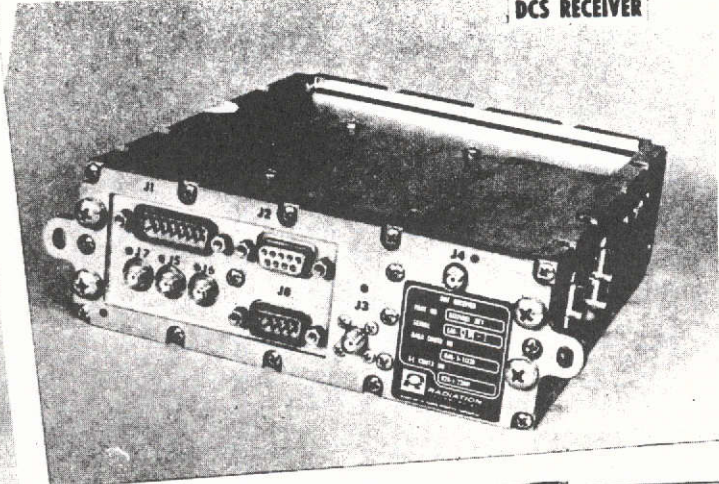


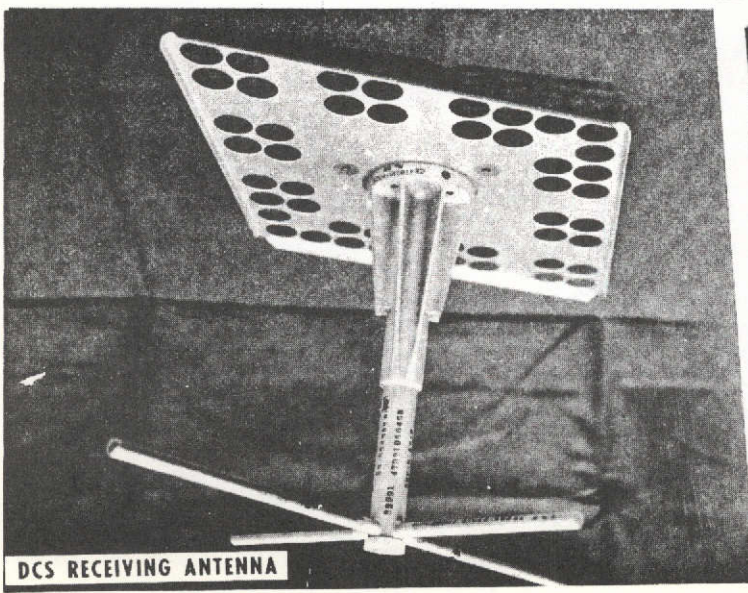
Figure 21-2. Data Collection Data Flow



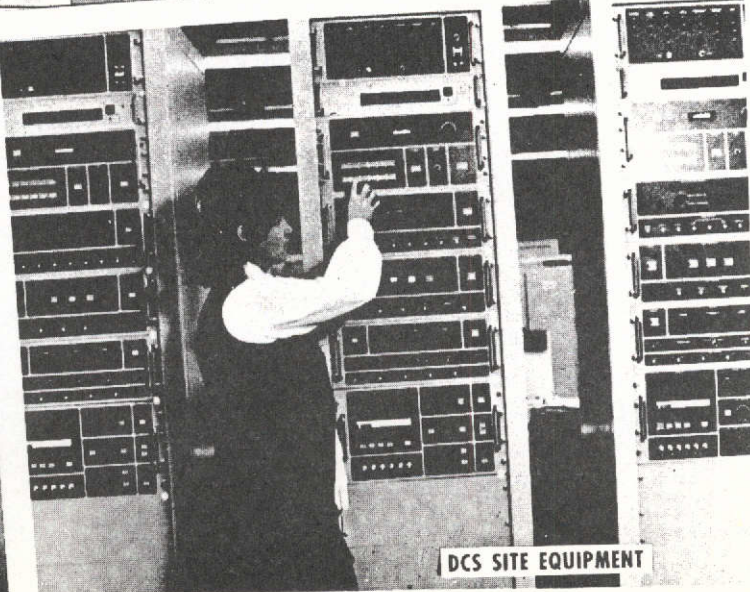
DCS PLATFORM



DCS RECEIVER



DCS RECEIVING ANTENNA

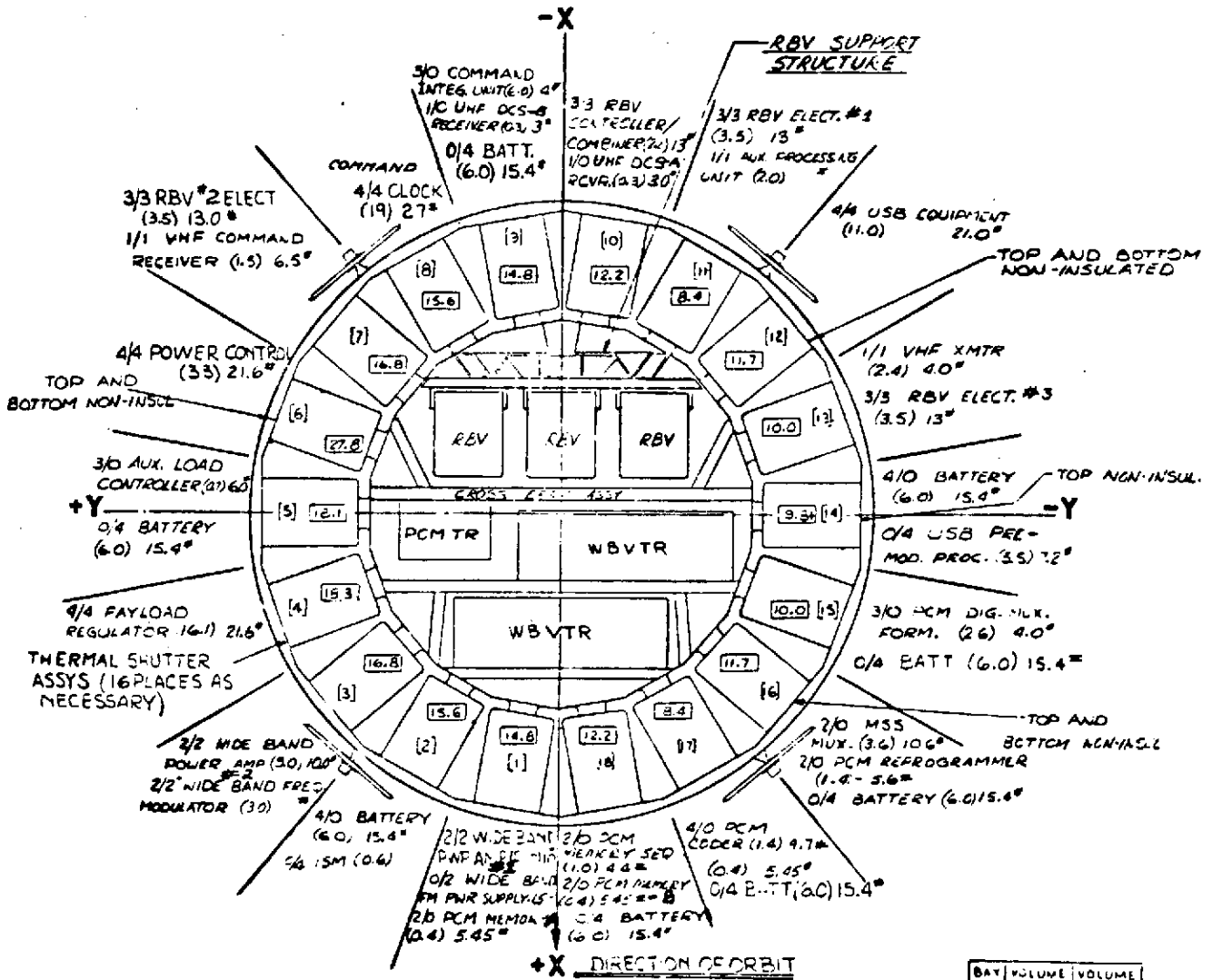


DCS SITE EQUIPMENT

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Figure 21-3. Data Collection Subsystem

APPENDIX A  
LANDSAT-2 CONFIGURATION



**SECTION A-A**

ROTATED 33° CCW

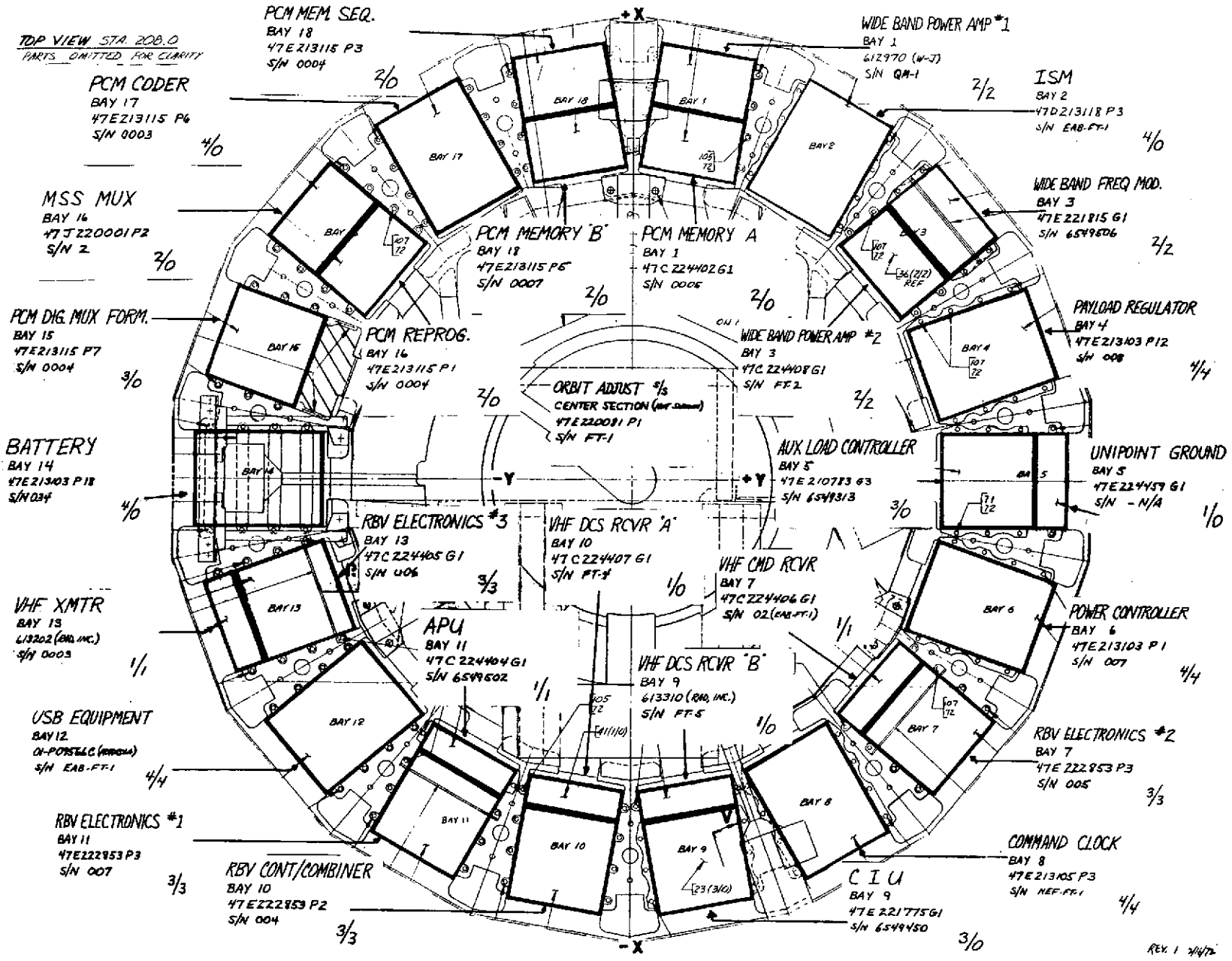
- [1] = BAY NO
- [11.1] = WATTS DISSIPATED (ORBIT AVERAGE)
- [11.1] = BAY HEAT DISSIPATING CAP
- # = UNIT WEIGHT

| BAY NO | VOLUME USED | VOLUME UNUSED |
|--------|-------------|---------------|
| 1      | 3/4         | —             |
| 2      | 4/4         | —             |
| 3      | 4/4         | —             |
| 4      | 4/4         | —             |
| 5      | 3/4         | 1/4           |
| 6      | 4/4         | —             |
| 7      | 4/4         | —             |
| 8      | 4/4         | —             |
| 9      | 4/4         | —             |
| 10     | 4/5         | 1/5           |
| 11     | 4/4         | —             |
| 12     | 4/4         | —             |
| 13     | 4/4         | —             |
| 14     | 4/4         | —             |
| 15     | 3/4         | 1/4           |
| 16     | 4/4         | —             |
| 17     | 4/4         | —             |
| 18     | 4/4         | —             |

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Figure A-1. LANDSAT-2 Equipment and Payload Location





REV 1 2/4/72

Figure A-2. LANDSAT-2 Equipment and Payload Location



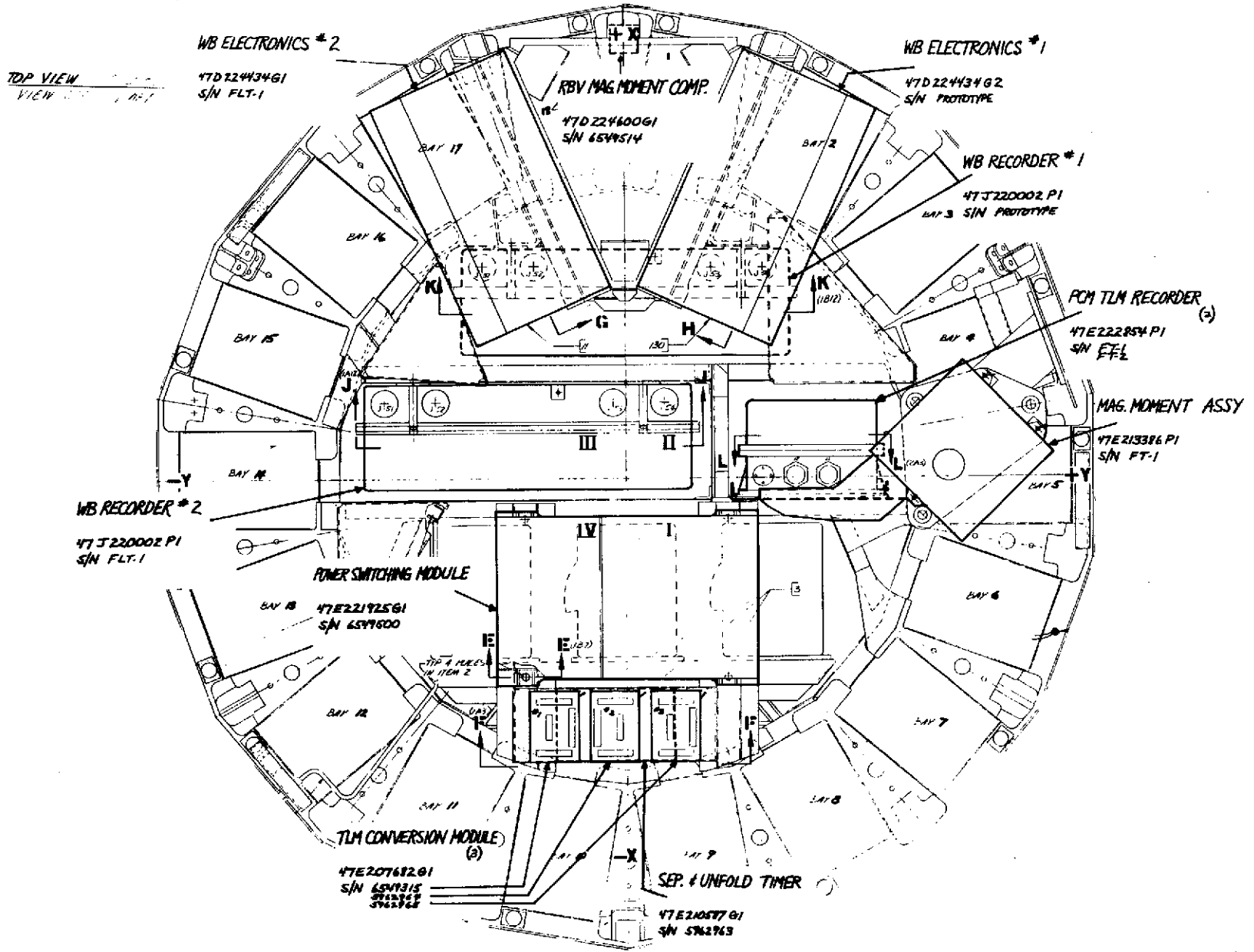


Figure A-4. LANDSAT-2 Equipment and Payload Location

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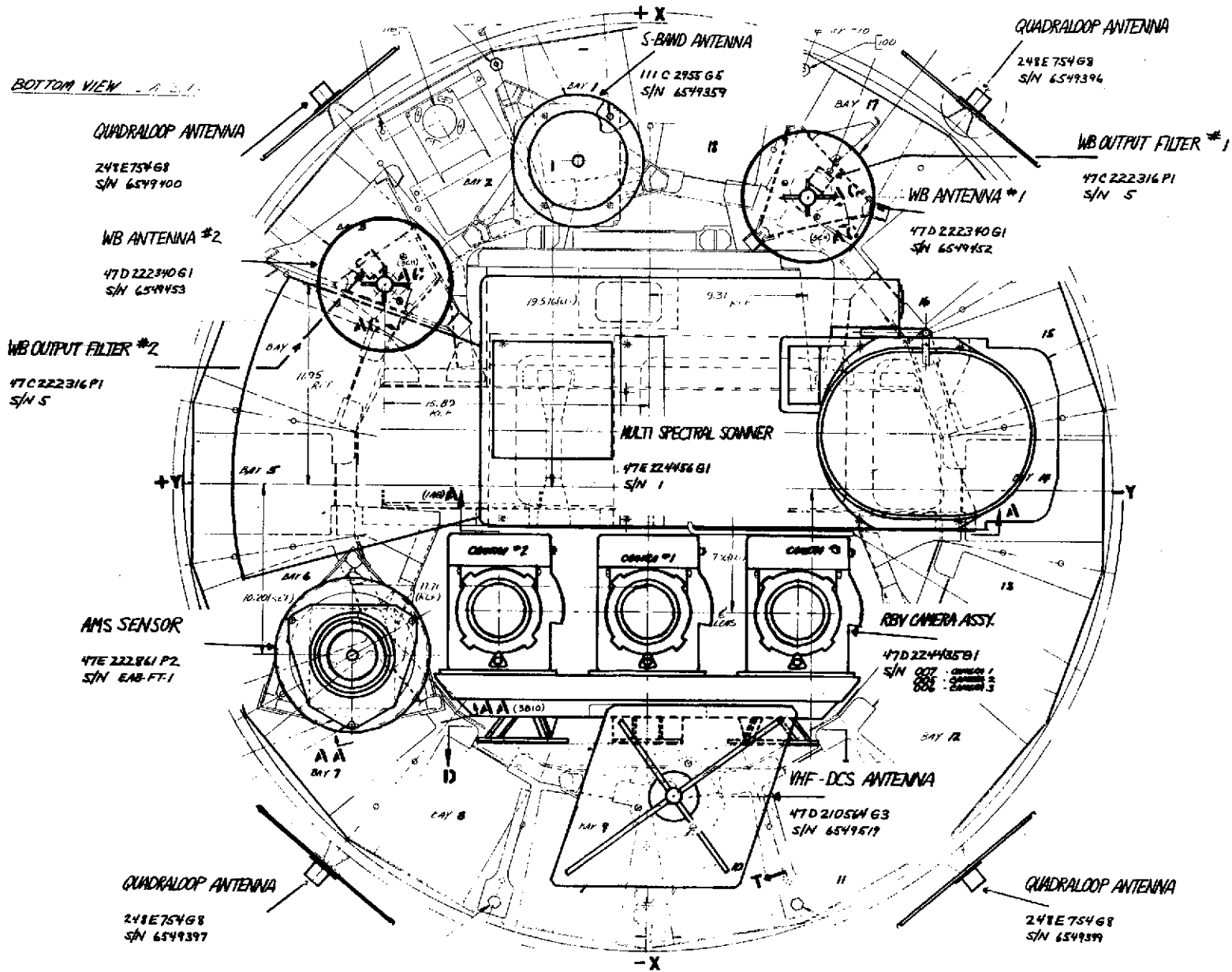


Figure A-5. LANDSAT-2 Equipment and Payload Location

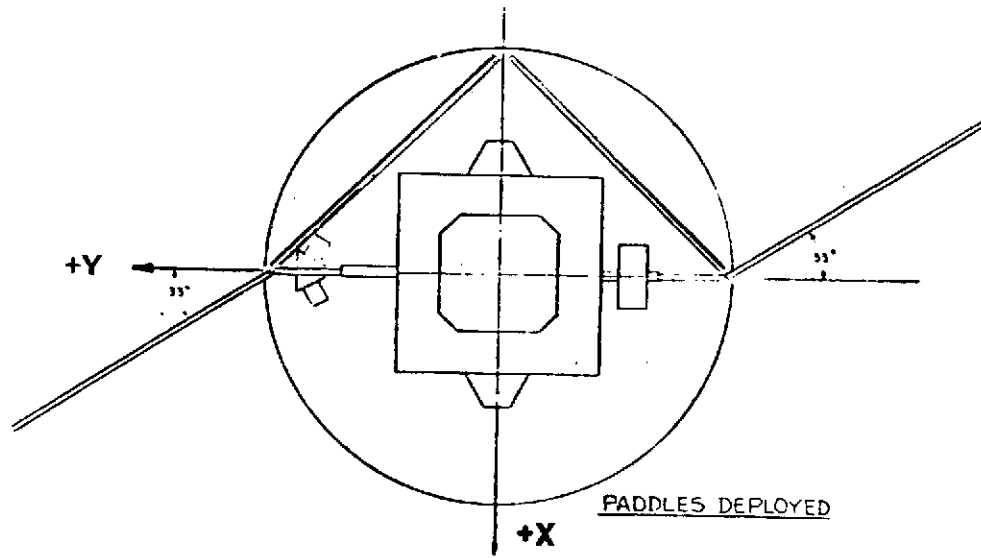
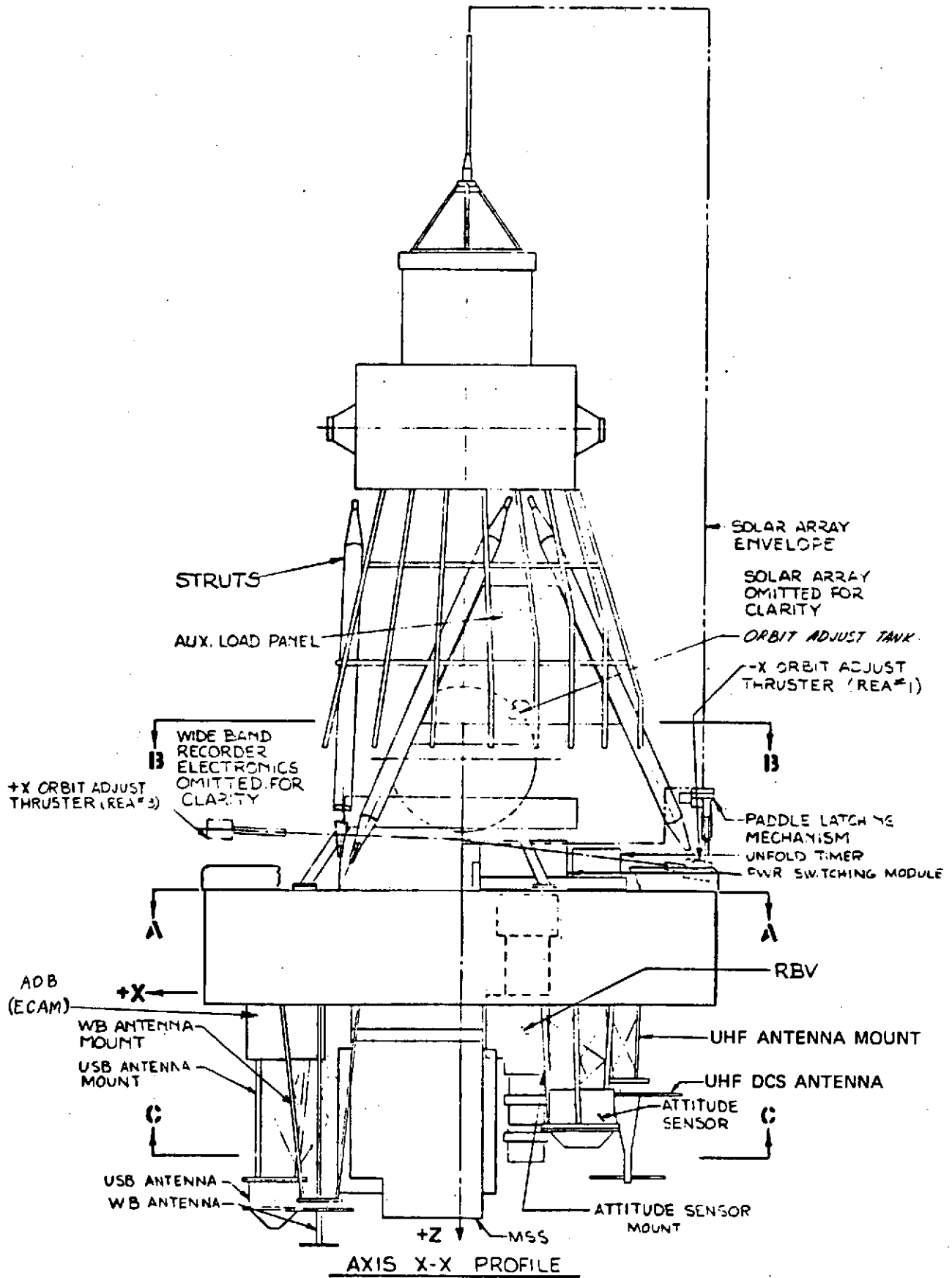


Figure A-6. LANDSAT-2 Equipment



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Figure A-7. LANDSAT-2 Configuration

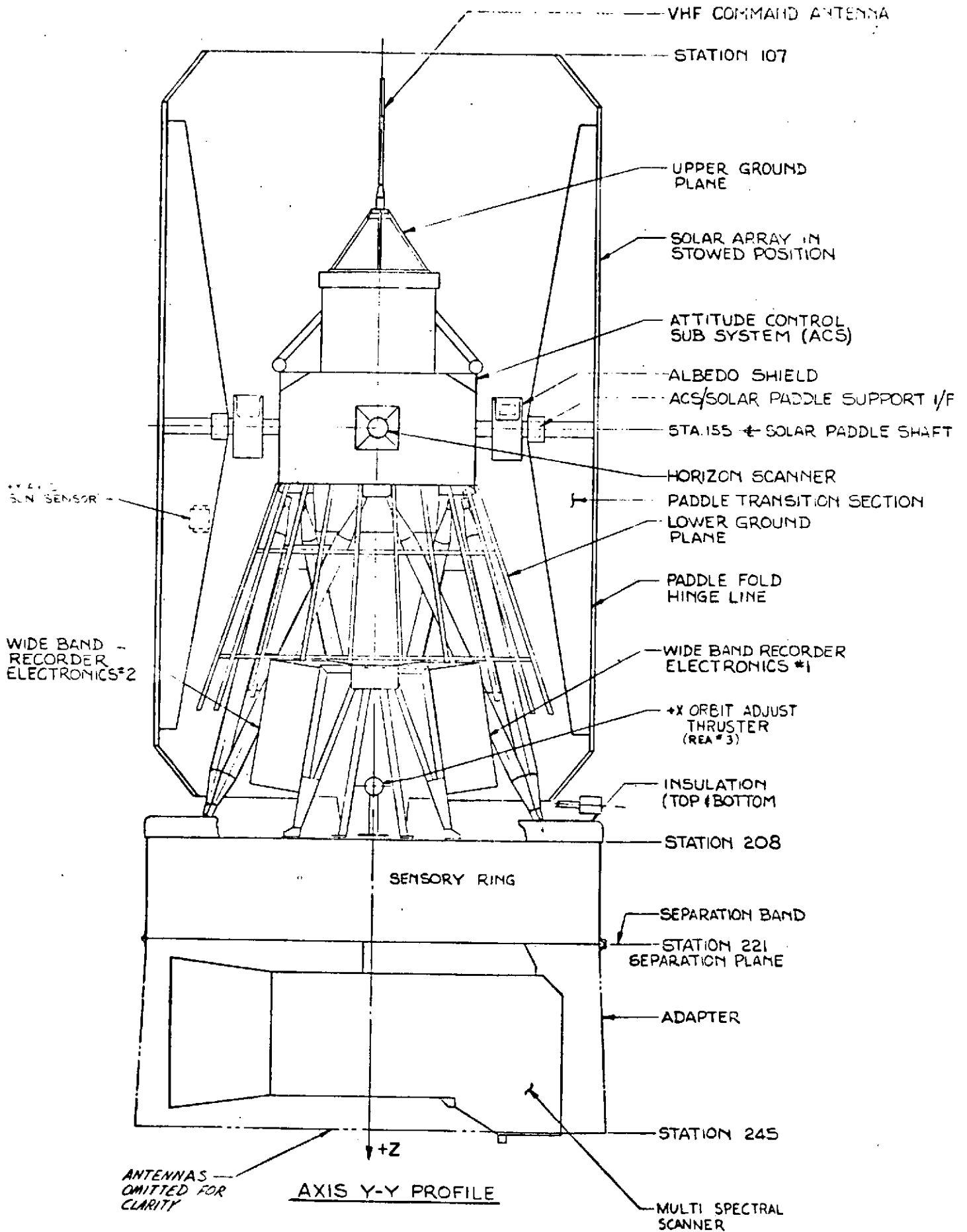


Figure A-8. LANDSAT-2 Configuration

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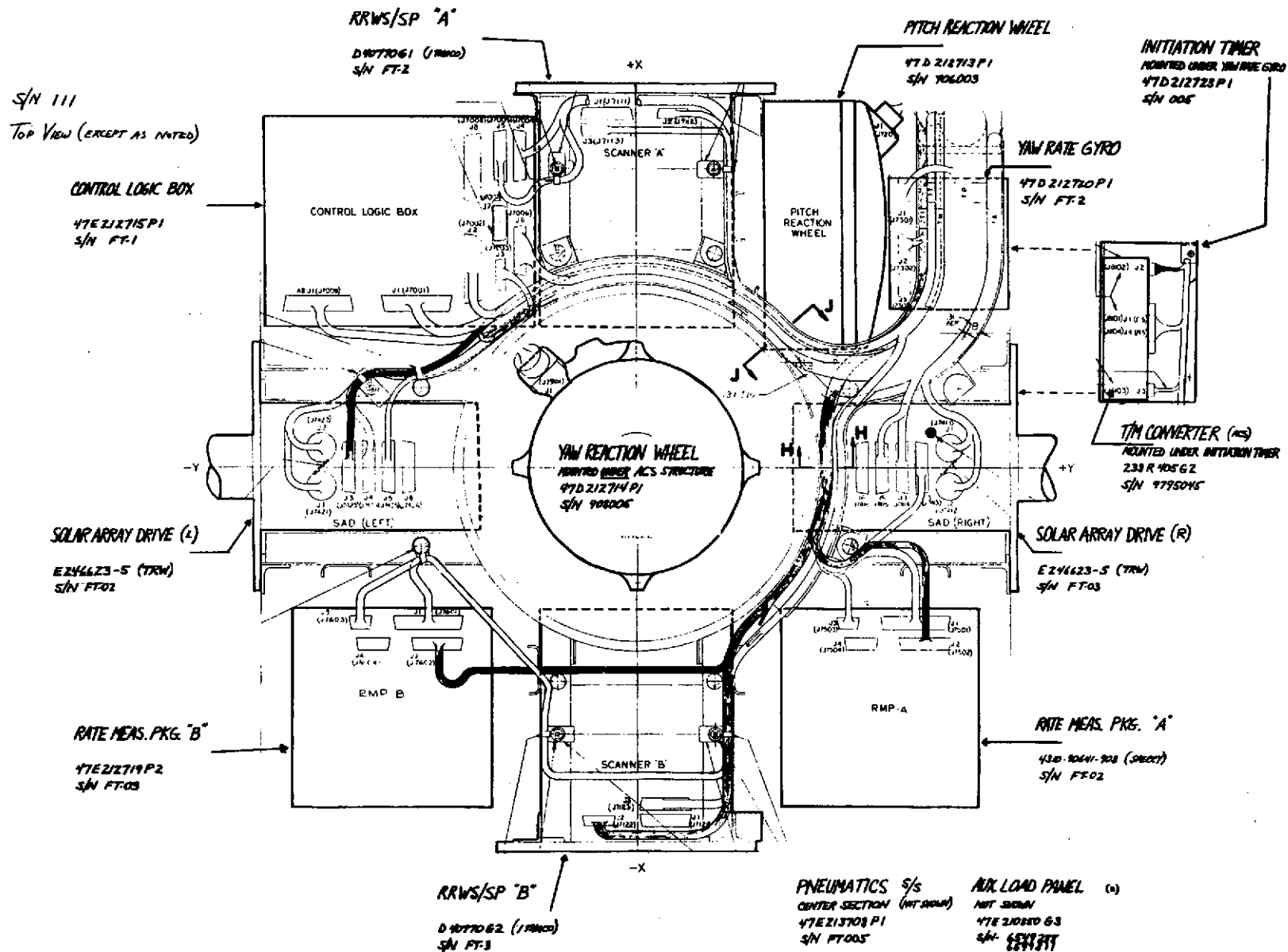
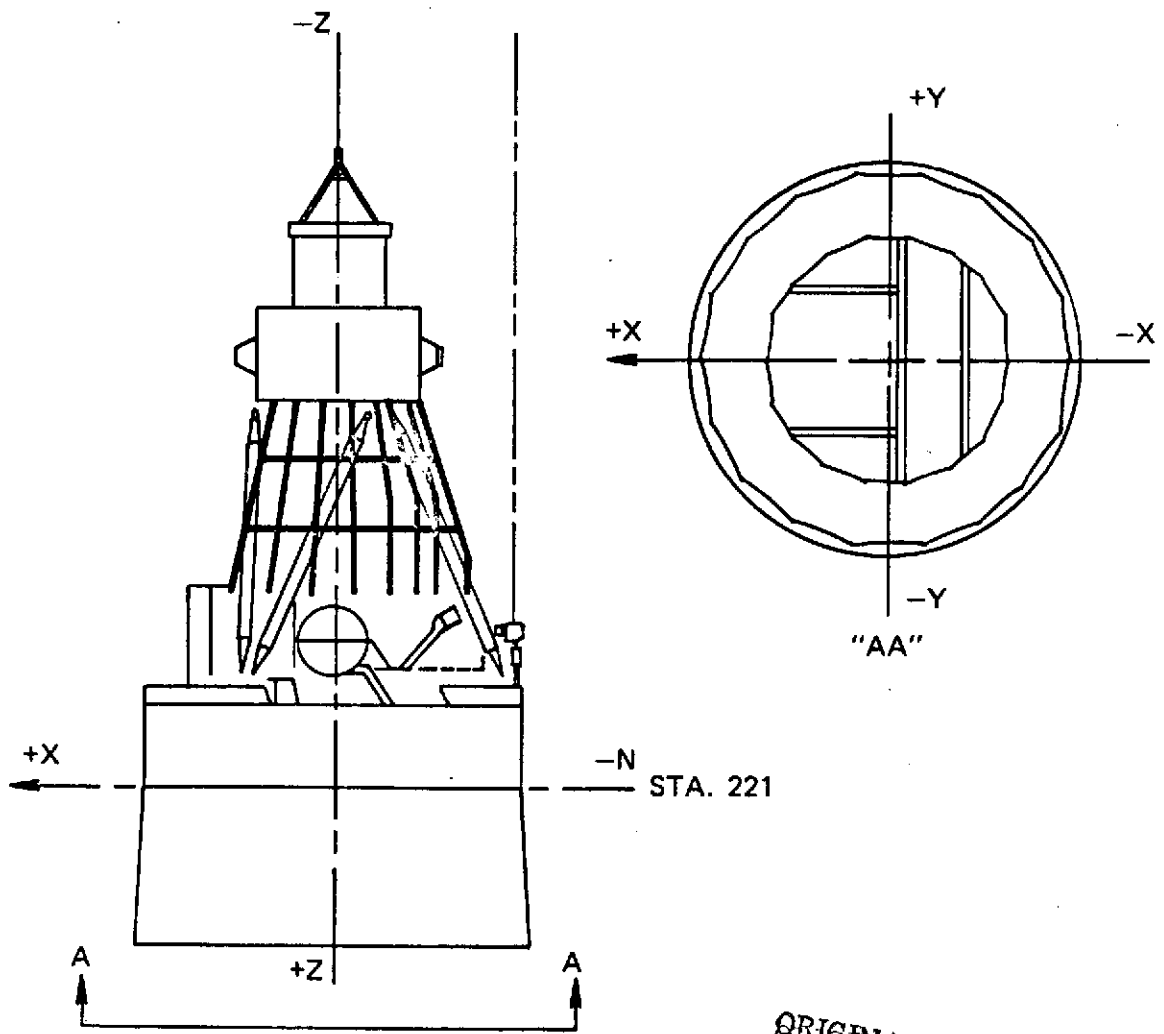


Figure A-9. LANDSAT-2 Attitude Control System





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Figure A-10. LANDSAT-2 Observatory Reference Axes



CONSOLIDATED CONFIGURED ARTICLES LIST

# ERTS SPACECRAFT 903

(LANDSAT 2)

Revision Status of Pages

| SHEET #   | INITIAL ISSUE | REV A   | REV B    | REV C | REV D | REV E | REV F | REV G |
|-----------|---------------|---------|----------|-------|-------|-------|-------|-------|
| I (INDEX) | 4/12/74       | 11/6/74 |          |       |       |       |       |       |
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| 4         | 4/12/74       |         |          |       |       |       |       |       |
| 5         | 4/12/74       |         |          |       |       |       |       |       |
| 6         | 4/12/74       | 11/6/74 |          |       |       |       |       |       |
| 7         | 4/12/74       |         |          |       |       |       |       |       |
| 8         | 4/12/74       |         |          |       |       |       |       |       |
| 9         | 4/12/74       | 11/6/74 |          |       |       |       |       |       |
| 10        | 4/12/74       |         |          |       |       |       |       |       |
| 11        | 4/12/74       |         |          |       |       |       |       |       |
| 12        | 4/12/74       |         |          |       |       |       |       |       |
| 13        | 4/12/74       |         |          |       |       |       |       |       |
| 14        | 4/12/74       |         |          |       |       |       |       |       |
| 15        | 4/12/74       |         |          |       |       |       |       |       |
| 16        | 4/12/74       |         |          |       |       |       |       |       |
| 17        | 4/12/74       |         |          |       |       |       |       |       |
| 18        | 4/12/74       |         |          |       |       |       |       |       |
| 19        | 4/12/74       | 5/20/74 | 12/16/74 |       |       |       |       |       |
| 20        | 4/12/74       | 11/6/74 | 12/16/74 |       |       |       |       |       |

- Note 1. Those items which have been added or changed in this revision are noted with heavy black lines in the right margin.
2. Change-out log since January 1, 1973 appears on back of cover sheet.

ISSUED BY CONFIGURATION MANAGEMENT OFFICE

December 16, 1974

CONFIGURATION CHANGES SINCE JANUARY 1, 1973

| NOMENCLATURE                   | DRAWING NO.   | REMOVED  |                                    | REPLACED |                                  | COMMENTS                          |
|--------------------------------|---------------|----------|------------------------------------|----------|----------------------------------|-----------------------------------|
|                                |               | DATE     | S.N.                               | DATE     | S.N.                             |                                   |
| Batteries                      | 2265943-501   | 3/27/73  | 049-056                            | 3/27/73  | 057-064                          | Install Flight batteries          |
| PCM TLM Recorder #1            | 202835-001    | 3/27/73  | EAB-FT3                            | 3/27/73  | EAB-QM1                          | Qual Unit has better test history |
| MSS Multiplexer                | 3241140-100   | 4/12/73  | 1                                  | 10/11/73 | ENG.                             | Return to Hughes for rework       |
| Power Control Module           | 1759712-502   | 5/10/73  | 010                                | 5/25/73  | 010                              | Reworked                          |
| USBE                           | 01-P09566C001 | 5/30/73  | EAB-QM                             | 5/31/73  | EAB-FT1                          | Test Anomaly (D03770)             |
| Batteries                      | 2265943-501   | 7/24/73  | 059, 062                           | 10/8/73  | ENG 008,<br>009                  | Flight units in cold storage      |
| Batteries                      | 2265943-501   | 7/26/73  | 057, 058,<br>060, 061,<br>063, 064 | 3/11/74  | 057, 058<br>060, 061<br>063, 064 | Cold storage                      |
| MSS Scanner                    | 43727         | 11/9/73  | ENG                                | 12/3/73  | 2                                | Install Flight Unit               |
| WB Frequency Mod.<br>Modulator | 47E221815G1   | 11/13/73 | 6549507                            | 11/29/73 | 6549505                          | Install Flight Unit               |
| WBFM Power Supply              | 47C223321G1   | 11/29/73 | 6549510                            | 11/29/73 | 6549508                          | Install Flight Unit               |
| MSS Multiplexer                | 3241140-110   | 11/13/73 | ENG                                | 12/3/73  | 1                                | Reinstall after rework            |
| MSS Scanner                    | 43727         | 12/26/73 | 2                                  | 4/4/74   | 2                                | Removed for special test          |
| RBV MMCA                       | 47D224600G1   | 1/2/74   | 6549513                            | 3/6/74   | 6549513                          |                                   |
| REV CCC                        | 2265336-501   | 1/7/74   | 003                                | 1/18/74  | 003                              |                                   |
| VIP Memory B                   | 608191G10     | 1/29/74  | 008                                | 2/12/74  | 008                              | Memory was reprogrammed           |
| Batteries                      | 2265943-501   | 3/11/74  | ENG 008,<br>009                    | 3/11/74  | 059, 062                         | Reinstall Flight batteries        |
| USBE                           | 01-P09566C001 | 3/13/74  | EAB-FT1                            | 3/13/74  | EAB-QM                           | Test anomaly (D07227)             |
| APU                            | 47E221855G1   | 4/24/74  | 6549504                            | 4/24/74  | 6549502                          | Test anomaly (D08157)             |
| WBVTR Elect. #2                | 8370323-501   | 5/10/74  | FLT1                               | 5/16/74  | FLT1                             | Removed for rework                |
| RBV Electronics #2             | 1976466-501   | 6/16/74  | 002                                | 8/19/74  | 004                              | Removed for rework                |
| RBV CCC                        | 2265336-501   | 6/16/74  | 003                                | 7/25/74  | 002                              | Test anomaly (D08159)             |
| WBVTR Electronics #2           | 8370323-501   | 6/16/74  | FLT1                               | 7/15/74  | FLT6                             | Trouble-shoot MR D08150           |
| WBVTR Electronics #1           | 8370323-501   | 6/16/74  | FLT2                               | 7/16/74  | FLT6                             | Test anomaly (D08193)             |
| RBV Camera #2                  | 1976477-501   | 6/17/74  | 002                                | 8/19/74  | 004                              | Removed for rework                |
| Command Clock                  | 20001-102-301 | 6/17/74  | EAB-FT2                            | 6/17/74  | F003                             | Test anomaly (D08198)             |
| WBVTR #2                       | 8358497-501   | 6/21/74  | FLT1                               | 7/15/74  | FLT6                             | Trouble-shoot MR D08150           |
| WBVTR #1                       | 8358497-501   | 6/21/74  | FLT2                               | 7/16/74  | FLT6                             | Test Anomaly (D08193)             |
| WBVTR Electronics #1           | 8370323-501   | 7/17/74  | FLT6                               | 7/23/74  | FLT1                             | Trouble-shoot MR D08150           |
| WBVTR #1                       | 8358497-501   | 7/17/74  | FLT6                               | 7/23/74  | FLT1                             | Trouble-shoot MR D08150           |
| Command Clock                  | 20001-102-301 | 7/21/74  | F003                               | 7/22/74  | EAB-FT2                          | Returned after rework             |
| MSS Scanner                    | 43727         | 7/15/74  | 2                                  | 7/24/74  | 2                                | Reworked                          |
| MSS Scanner                    | 43727         | 7/25/74  | 2                                  | 7/29/74  | 2                                | Reworked                          |
| WBVTR #1                       | 8358497-501   | 7/26/74  | FLT1                               | 7/26/74  | FLT2                             | Trouble-shoot MR D08150           |
| WBVTR Electronics #1           | 8370323-501   | 7/26/74  | FLT1                               | 7/26/74  | FLT2                             | Trouble-shoot MR D08150           |
| RBV CCC                        | 2265336-501   | 8/16/74  | 002                                | 8/19/74  | 003                              | Returned after rework.            |
| ECAM                           | GF1308902     | 8/16/74  | 101                                | 8/20/74  | 101                              | Reworked                          |
| WBVTR Electronics #1           | 8370323-501   | 11/8/74  | FLT2                               | 11/11/74 | FLT 2                            | Reworked                          |

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CONSOLIDATED CONFIGURED ARTICLES LIST

ERTS SPACECRAFT 903

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| Item                                | Page  | Item                                 | Page  |
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| Attitude Measurement Sensor         | 13    | Power Switching Module (PSM)         | 5     |
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|                                     |       | Telemetry Conversion Modules, ACS    | 16    |
| Mag. Moment Comp. Assembly-ACS      | 13    | Temperature Controllers              | 4     |
| Mag. Moment Comp. Assembly-RBV      | 5     | Thermal Subsystem, ACS               | 16    |
| Module, Interface Switching         | 15    | Timer, Initiation, ACS               | 17    |
| Module, Payload Regulator           | 9     | Timer, Separation and Unfold         | 2     |
| Module, Power Control               | 9     | Transmitter, VHF                     | 20    |
| Module, Power Switching (PSM)       | 5     |                                      |       |
| Module, Telemetry Conversion        | 2     | Unfold Switch                        | 2     |
| Module, Telemetry Conversion, ACS   | 16    | Unified S Band Equipment             | 7,8   |
| Multi Spectral Scanner (MSS), & Mux | 20    |                                      |       |
| Narrow Band Tape Recorder           | 14    | Versatile Information Processor      | 11,12 |
| Orbit Adjust Subsystem              | 13    |                                      |       |
|                                     |       | Wideband Filter                      | 8     |
| Paddle Dampers                      | 19    | Wideband Frequency Modulator (WBFM)  | 3     |
| Panels, Aux. Load                   | 2     | WBFM Power Supply                    | 5     |
| Payload Regulator Module            | 9     | Wideband Power Amplifiers            | 13,14 |
| PCM TIM Tape Recorder               | 14    | Wideband Video Tape Recorder (WBVTR) | 20    |
| Pitch Reaction Wheel                | 16    | & Electr.                            |       |
| Pneumatics, ACS                     | 17    |                                      |       |
| Power Amplifiers, Wideband          | 13,14 | Yaw Rate Gyro                        | 19    |
|                                     |       | Yaw Reaction Wheel                   | 16    |

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CONSOLIDATED CONFIGURED ARTICLES LIST

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| NOMENCLATURE                   | SUPPLIER | DWG & PART NO. | REV    | SERIAL NO. |
|--------------------------------|----------|----------------|--------|------------|
| COMMAND INTEGRATION UNIT       | GE-SS    | 47E221775G1    | AN -5  | 6549449    |
| Chassis Ass'y A1               | GE-SS    | 47D221813G1    | AN -3  | PQ516      |
| Cordwood Module A3             | GE-SS    | 47D221797G1    | AN -4  | PQ245      |
| Cordwood Module A5             | GE-SS    | 47D221798G1    | AN -5  | PQ216      |
| Cordwood Module A6             | GE-SS    | 47D221796G1    | AN -4  | PR401      |
| Cordwood Module A7             | GE-SS    | 47D221799G1    | AN -4  | PP880      |
| Cordwood Module A8             | GE-SS    | 47E221800G1    | AN -3  | PP883      |
| Stick Module A9                | GE-SS    | 47E221801G1    | None   | PP694      |
| Stick Module A12               | GE-SS    | 47E221804G1    | AN -1  | PP686      |
| Stick Module A13               | GE-SS    | 47E221805G1    | None   | PP692      |
| Stick Module A14               | GE-SS    | 47E221806G1    | AN -2  | PP691      |
| Stick Module A15               | GE-SS    | 47E221807G1    | AN -1  | PP688      |
| Cordwood Module A16            | GE-SS    | 47E221852G1    | AN -2  | PP817      |
| Stick Module A17               | GE-SS    | 47E221853G1    | AN -3  | PP835      |
| Cordwood Module A18            | GE-SS    | 47E221851G1    | AN -5  | PP383      |
| Chassis Ass'y A2               | GE-SS    | 47D221813G2    | AN -3  | PQ477      |
| Cordwood Module A3             | GE-SS    | 47D221797G1    | AN -4  | PQ246      |
| Cordwood Module A5             | GE-SS    | 47D221798G1    | AN -5  | PQ217      |
| Cordwood Module A6             | GE-SS    | 47D221796G1    | AN -4  | PQ635      |
| Cordwood Module A7             | GE-SS    | 47D221799G1    | AN -4  | PP881      |
| Cordwood Module A8             | GE-SS    | 47E221800G1    | AN -3  | PP882      |
| Stick Module A9                | GE-SS    | 47E221801G1    | None   | PQ415      |
| Stick Module A12               | GE-SS    | 47E221804G1    | AN -1  | PQ315      |
| Stick Module A13               | GE-SS    | 47E221808G1    | None   | PP689      |
| Stick Module A14               | GE-SS    | 47E221806G1    | AN -2  | PP690      |
| Stick Module A15               | GE-SS    | 47E221807G1    | AN -1  | PP687      |
| Cordwood Module A16            | GE-SS    | 47E221852G1    | AN -2  | PP815      |
| Stick Module A17               | GE-SS    | 47E221853G1    | AN -3  | PP836      |
| Cordwood Module A18            | GE-SS    | 47D221851G1    | AN -5  | PQ386      |
| Chassis Ass'y A3               | GE-SS    | 47D221811G1    | AN -4  | PQ431      |
| P.C. Bd. Ass'y A1              | GE-SS    | 47D221918G1    | AN -6  | PQ349      |
| Rect. & Filter Module A2       | GE-SS    | 47D221793G1    | None   | PP415      |
| P.C. Bd. Ass'y A3              | GE-SS    | 47D221919G1    | AN -5  | PQ350      |
| Rect. & Filter Module A4       | GE-SS    | 47D221793G1    | None   | PP238      |
| SEP. & UNFOLD TIMER            | GE-SS    | 47E210587G1    | AN -2  | 6549349    |
| Comp. Assy. A1                 | GE-SS    | 47E210585G1    | AN -1  | PO501      |
| AUX LOAD PANEL #1              | GE-SS    | 47E210850G3    | AN -11 | 6549346    |
| AUX LOAD PANEL #2              | GE-SS    | 47E210850G3    | AN -11 | 6549345    |
| TELEMETRY CONVERSION MODULE #1 | GE-SS    | 47E207682G1    | AN -15 | 6549337    |
| TELEMETRY CONVERSION MODULE #2 | GE-SS    | 47E207682G1    | AN -15 | 6549338    |
| TELEMETRY CONVERSION MODULE #3 | GE-SS    | 47E207682G1    | AN -15 | 6549334    |
| UNFOLD SWITCH                  |          | 133B1943P2     | AN-4   | 4-32116    |

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| NOMENCLATURE           | SUPPLIER | DWG & PART NO. | REV   | SERIAL NO. |
|------------------------|----------|----------------|-------|------------|
| AUX. PROCESSING UNIT   | GE-SS    | 47E221855-G1   | AN-14 | 6549502    |
| Housing Assy. 1        | GE-SS    | 47E221899-G1   | AN-6  | N/A        |
| IC Chassis Assy. 2     | GE-SS    | 47E221884-G1   | AN-4  | PP906      |
| Module A1              | GE-SS    | 47E221861-G1   | AN-3  | PP216      |
| Module A2              | GE-SS    | 47E221862-G1   | AN-1  | PP281      |
| Module A3              | GE-SS    | 47E221861-G1   | AN-3  | PP210      |
| Module A4              | GE-SS    | 47E221862-G1   | AN-1  | PP412      |
| Module A5              | GE-SS    | 47E221867-G1   | AN-3  | PP172      |
| Module A6              | GE-SS    | 47E221868-G1   | AN-6  | PP196      |
| Module A7              | GE-SS    | 47E221868-G1   | AN-6  | PP179      |
| Module A8              | GE-SS    | 47E221865-G1   | AN-2  | PP253      |
| Module A9              | GE-SS    | 47E221866-G1   | AN-2  | PP171      |
| Module A10             | GE-SS    | 47E221863-G1   | AN-1  | PP170      |
| Module A11             | GE-SS    | 47E221864-G1   | AN-3  | PP203      |
| Module A12             | GE-SS    | 47E221869-G1   | AN-2  | PP173      |
| Module A13             | GE-SS    | 47E221870-G1   | AN-1  | PP174      |
| Module A14             | GE-SS    | 47E221871-G1   | AN-2  | PP209      |
| Module A15             | GE-SS    | 47E221872-G1   | AN-1  | PP244      |
| Module A16             | GE-SS    | 47E221873-G1   | AN-2  | PP227      |
| Module A17             | GE-SS    | 47E221874-G1   | AN-1  | PP178      |
| Module A18             | GE-SS    | 47D221875-G1   | AN-1  | PP418      |
| Module A19             | GE-SS    | 47D221881-G1   | AN-6  | PP198      |
| Module A20             | GE-SS    | 47D221875-G1   | AN-1  | PP417      |
| Module A21             | GE-SS    | 47D221881-G1   | AN-6  | PP195      |
| Module A22             | GE-SS    | 47D221882-G1   | AN-2  | PP150      |
| Module A23             | GE-SS    | 47D221880-G1   | AN-3  | PP199      |
| Module A24             | GE-SS    | 47D221875-G1   | AN-1  | PP416      |
| Module A25             | GE-SS    | 47D221881-G1   | AN-6  | PP197      |
| Module A26             | GE-SS    | 47D221876-G1   | AN-3  | PP204      |
| PC Bd. Assy. A27       | GE-SS    | 47D221894-G1   | AN-6  | PP533      |
| PC Bd. Assy. A28       | GE-SS    | 47D221897-G1   | AN-1  | PP901      |
| Module A29             | GE-SS    | 47D221906-G1   | AN-4  | Unknown    |
| WB FREQ. MOD. ASS'Y.   | GE-SS    | 47E221815G1    | AN-9  | 6549505    |
| PW Board Ass'y A1      | GE-SS    | 47E221832G1    | AN-7  | PQ286      |
| PW Board Ass'y A2      | GE-SS    | 47E221832G1    | AN-7  | PQ444      |
| PW Board Ass'y A3      | GE-SS    | 47D221830G1    | AN-3  | PQ192      |
| PW Board Ass'y A4      | GE-SS    | 47D221834G1    | AN-4  | PQ037      |
| PW Board Ass'y A5      | GE-SS    | 47E221826G1    | AN-6  | PQ015      |
| PW Board Ass'y A6      | GE-SS    | 47E221828G1    | AN-5  | PQ038      |
| PW Board Ass'y A7      | GE-SS    | 47E221830G1    | AN-3  | PQ284      |
| PW Board Ass'y A8      | GE-SS    | 47D221836G1    | AN-8  | PQ334      |
| PW Board Ass'y A9      | GE-SS    | 47D221836G1    | AN-8  | PQ597      |
| Ref. Osc. X4 Mult. A11 | GE-SS    | 47E223316G1    | AN-2  | PQ039      |
| Volt Reg/VCO A15       | GE-SS    | 47E223311G1    | AN-7  | PQ026      |
| Volt Reg/VCO A16       | GE-SS    | 47E223311G1    | AN-7  | PQ025      |
| Volt Reg/VCO A17       | GE-SS    | 47E223311G2    | AN-7  | PQ028      |
| Volt Reg/VCO A18       | GE-SS    | 47E223311G2    | AN-7  | PQ027      |
| Diode Module A19       | GE-SS    | 47E223380G1    | AN-1  | PQ001      |
| Stripline              | GE-RESD  | 47D178444G1    | Rev F | MY583-A1   |
| Dis. If. Lim. A12      | GE-RESD  | 47C148186P1    | Rev B | MY585-A1   |

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| <b>NOMENCLATURE</b>                      | <b>SUPPLIER</b>    | <b>DWG &amp; PART NO</b>   | <b>REV</b>   | <b>SERIAL NO.</b>    |
|--|--------------------|----------------------------|--------------|----------------------|
| TEMPERATURE CONTROLLER -BAY 1<br>Bellows | GE-SS<br>Flexonics | 47E213640G5<br>47C213633P1 | AN-7<br>AN-2 | 6549466<br>FX566-A92 |
| TEMPERATURE CONTROLLER -BAY 2<br>Bellows | GE-SS<br>Flexonics | 47E213640G5<br>47C213633P1 | AN-7<br>AN-2 | 6549460<br>FX566-A93 |
| TEMPERATURE CONTROLLER -BAY 3<br>Bellows | GE-SS<br>Flexonics | 47E213640G5<br>47C213633P1 | AN-7<br>AN-2 | 6549379<br>FX566-A20 |
| TEMPERATURE CONTROLLER -BAY 4<br>Bellows | GE-SS<br>Flexonics | 47E213640G5<br>47C213633P1 | AN-7<br>AN-2 | 6549378<br>FX566-A35 |
| TEMPERATURE CONTROLLER -BAY 5<br>Bellows | GE-SS<br>Flexonics | 47E213640G5<br>47C213633P1 | AN-7<br>AN-2 | 6549465<br>FX566-A57 |
| TEMPERATURE CONTROLLER -BAY 7<br>Bellows | GE-SS<br>Flexonics | 47E213640G5<br>47C213633P1 | AN-7<br>AN-2 | 6549459<br>FX566-A62 |
| TEMPERATURE CONTROLLER -BAY 8<br>Bellows | GE-SS<br>Flexonics | 47E213640G5<br>47C213633P1 | AN-7<br>AN-2 | 6549456<br>FX566-A78 |
| TEMPERATURE CONTROLLER -BAY 9<br>Bellows | GE-SS<br>Flexonics | 47E213640G5<br>47C213633P1 | AN-7<br>AN-2 | 6549464<br>FX566-A64 |
| TEMPERATURE CONTROLLER-BAY 10<br>Bellows | GE-SS<br>Flexonics | 47E213640G5<br>47C213633P1 | AN-7<br>AN-2 | 6549474<br>FX566-A76 |
| TEMPERATURE CONTROLLER-BAY 11<br>Bellows | GE-SS<br>Flexonics | 47E213640G5<br>47C213633P1 | AN-7<br>AN-2 | 6549455<br>FX566-A79 |
| TEMPERATURE CONTROLLER-BAY 12<br>Bellows | GE-SS<br>Flexonics | 47E213640G5<br>47C213633P1 | AN-7<br>AN-2 | 6549386<br>FX566-A41 |
| TEMPERATURE CONTROLLER-BAY 13<br>Bellows | GE-SS<br>Flexonics | 47E213640G5<br>47C213633P1 | AN-7<br>AN-2 | 6549380<br>FX566-A8  |
| TEMPERATURE CONTROLLER-BAY 14<br>Bellows | GE-SS<br>Flexonics | 47E213640G5<br>47C213633P1 | AN-7<br>AN-2 | 6549458<br>FX566-A73 |
| TEMPERATURE CONTROLLER-BAY 15<br>Bellows | GE-SS<br>Flexonics | 47E213640G5<br>47C213633P1 | AN-7<br>AN-2 | 6549457<br>FX566-A58 |
| TEMPERATURE CONTROLLER-BAY 16<br>Bellows | GE-SS<br>Flexonics | 47E213640G5<br>47C213633P1 | AN-7<br>AN-2 | 6549461<br>FX566-A77 |
| TEMPERATURE CONTROLLER-BAY 17<br>Bellows | GE-SS<br>Flexonics | 47E213640G5<br>47C213633P1 | AN-7<br>AN-2 | 6549462<br>FX566-A49 |
| TEMPERATURE CONTROLLER-BAY 18<br>Bellows | GE-SS<br>Flexonics | 47E213640G5<br>47C213633P1 | AN-7<br>AN-2 | 6549463<br>FX566-A70 |

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| NOMENCLATURE             | SUPPLIER | DWG & PART NO. | REV   | SERIAL NO. |
|--------------------------|----------|----------------|-------|------------|
| WBFM POWER SUPPLY        | GE-SS    | 47E223321G1    | AN-11 | 6549508    |
| Post Reg. Ass'y          | GE-SS    | 47D223325G1    | AN-5  | PP913      |
| XSTR Brkt. Ass'y         | GE-SS    | 47B223342G2    | AN-8  | PQ193      |
| Pwr Trans. Ass'y         | GE-SS    | 47D223356G1    | AN-1  | PQ720      |
| Pwr Trans. Ass'y         | GE-SS    | 47D223356G1    | AN-1  | PQ721      |
| Conv. Ass'y A1           | GE-SS    | 47D223305G1    | AN-5  | PP870      |
| Conv. Ass'y A3           | GE-SS    | 47D223305G2    | AN-5  | PP871      |
| Cap Module A5            | GE-SS    | 47E223309G1    | None  | PP532      |
| Diode Module A6          | GE-SS    | 47D223310G1    | AN-1  | PP530      |
| Rect. Ass'y A7           | GE-SS    | 47C223324G1    | AN-2  | PP897      |
| Rect. Ass'y A8           | GE-SS    | 47C223324G1    | AN-2  | PP898      |
| Diode Ass'y A9           | GE-SS    | 47C223349G1    | None  | PP877      |
| POWER SWITCHING MODULE   | GE-SS    | 47E221925G2    | AN-11 | 6549501    |
| Relay Ass'y A1           | GE-SS    | 47D221956G1    | AN-1  | PQ593      |
| Relay Ass'y A2           | GE-SS    | 47D221956G1    | AN-1  | PQ589      |
| Relay Ass'y A3           | GE-SS    | 47D221956G1    | AN-1  | PQ592      |
| Relay Ass'y A4           | GE-SS    | 47D221956G1    | AN-1  | PQ591      |
| Relay Ass'y A5           | GE-SS    | 47D221956G1    | AN-1  | PQ590      |
| Telem. Resistor Ass'y A6 | GE-SS    | 47D221954G1    | AN-3  | PQ587      |
| Diode Ass'y A7           | GE-SS    | 47D221955G1    | AN-2  | PQ588      |
| Fuse Ass'y A8            | GE-SS    | 47D221953G1    | AN-2  | PQ585      |
| Fuse Ass'y A9            | GE-SS    | 47D221953G2    | AN-2  | PQ586      |
| Relay Bd Ass'y A10       | GE-SS    | 47D221886G1    | AN-3  | PQ434      |
| Relay Panel, Top A11     | GE-SS    | 47D221969G2    | AN-4  | PS148      |
| Relay Panel, Bot. A12    | GE-SS    | 47D221970G2    | AN-5  | PS273      |
| COMMAND RECEIVER         | RCA      | 2271145-502    | R     | EAB-FT2    |
| A4 Receiver Assembly     | RCA      | 2270108-501    | F     | 003        |
| A1 IF Amp. Board         | RCA      | 2271156-501    | D     | 001        |
| A2 IF Amp. Board         | RCA      | 2271156-501    | D     | 002        |
| A3 Osc. & RF Amp. Board  | RCA      | 2270106-501    | C     | 001        |
| A4 Osc. & RF Amp. Board  | RCA      | 2270106-501    | C     | 002        |
| Demodulator Comp.        | RCA      | 2271154-501    | K     | 06         |
| Demodulator Comp.        | RCA      | 2271154-501    | K     | 07         |
| Regulator & Telemetry    | RCA      | 2271153-501    | F     | 03         |
| Antenna Coupler          | RCA      | 2262728-501    | B     | 06         |
| Diode Board Assembly     | RCA      | 1974688-501    | A     | 03         |
| Comp. Board Assembly     | RCA      | 2262746-501    | E     | 05         |
| RBV MMCA                 | GE-SS    | 47D224600G1    | AN-2  | 6549513    |
| Coil Housing             | GE-SS    | 47D224605G1    | None  | DJ098      |
| Panel Assembly           | GE-SS    | 47C224608G1    | AN-3  | PRO10      |
| Coil Assembly            | GE-SS    | 47D224602G1    | AN-2  | PQ900      |



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| NOMENCLATURE                     | SUPPLIER  | DWG & PART NO. | REV   | SERIAL NO. |
|----------------------------------|-----------|----------------|-------|------------|
| DCS RECEIVER "A"                 | Radiation | 613310G1       | C1    | EAB-FT2    |
| Preselector Assembly             | Radiation | 529220G1       | A     | 0003       |
| Second IF                        | Radiation | 124226G1       | C1    | 0002       |
| Limiter                          | Radiation | 124227G1       | A     | 0002       |
| Relay                            | Radiation | 124228G1       | A     | 0008       |
| First IF                         | Radiation | 124229G1       | C1    | 0003       |
| R.F. Amplifier                   | Radiation | 124230G1       | B1    | 0006       |
| Power Supply                     | Radiation | 124231G1       | A     | 0002       |
| Osc. & X6 VHF Receiver           | Radiation | 124232G1       | A     | 0002       |
| First Doubler                    | Radiation | 124233G1       | A     | 0003       |
| Second Doubler                   | Radiation | 124234G1       | A     | 0002       |
| Buffer Amplifier                 | Radiation | 124609G1       | A     | 0002       |
| DCS RECEIVER "B"                 | Radiation | 613310G1       | C1    | EAB-FT3    |
| Preselector Assembly             | Radiation | 529220G1       | A     | 0006       |
| Second IF                        | Radiation | 124226G1       | C1    | 0003       |
| Limiter                          | Radiation | 124227G1       | A     | 0003       |
| Relay                            | Radiation | 124228G1       | A     | 0006       |
| First IF                         | Radiation | 124229G1       | C1    | 0002       |
| R.F. Amplifier                   | Radiation | 124230G1       | B1    | 0008       |
| Power Supply                     | Radiation | 124231G1       | A     | 0003       |
| Osc. & X6 VHF Receiver           | Radiation | 124232G1       | A     | 0003       |
| First Doubler                    | Radiation | 124233G1       | A     | 0001       |
| Second Doubler                   | Radiation | 124234G1       | A     | 0001       |
| Buffer Amplifier                 | Radiation | 124609G1       | A     | 0003       |
| PREMOD. PROCESSOR                | SCI       | 2600000-1      | A     | EAB-FT2    |
| Electronics Assy.                | SCI       | 2600060-1      | A     | 003        |
| PCB Assy., Pwr. Filter           | SCI       | 2600037-1      | A     | 002        |
| PCB Assy., Pwr. Supply           | SCI       | 2600049-1      | A     | 002        |
| PCB Assy., Pwr. Supply           | SCI       | 2600049-1      | A     | 007        |
| PCB Assy., Sec. Sw.              | SCI       | 2600068-1      | B     | 005        |
| PCB Assy., Tape Rec. Sw.         | SCI       | 2600043-1      | B     | 003        |
| PCB Assy., 597KHZ Mod.           | SCI       | 2600031-1      | A     | 003        |
| PCB Assy., 768KHZ Mod.           | SCI       | 2600034-1      | B     | 001        |
| PCB Assy., CSSN                  | SCI       | 2600046-1      | A     | 004        |
| PCB Assy., Discriminator         | SCI       | 2600040-1      | A     | 006        |
| PCB Assy., Discriminator         | SCI       | 2600040-1      | A     | 002        |
| AUX LOAD CONTROLLER              | GE-SS     | 47E210783G4    | AN-10 | 6549352    |
| Relay Panel A1                   | GE-SS     | 47E210781G1    | AN-11 | PP134      |
| Relay Panel A2                   | GE-SS     | 47E210787G1    | AN-14 | P0573      |
| ADAPTER                          | GE-SS     | 47J213521G1    | AN-2  | 010        |
| PREFLIGHT DISCONNECT             | KINETICS  | 47E211225P2    | None  | 0012       |
| SEPARATION SWITCHES (ADAPTER)    | MINN.-H   | 133B1902P2     | AN-5  | 212, 215   |
| SEPARATION SWITCHES (SPACECRAFT) | MINN.-H   | 133B1902P2     | AN-5  | 209, 211   |

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| NOMENCLATURE               | SUPPLIER | DWG & PART NO. | REV  | SERIAL NO. |
|----------------------------|----------|----------------|------|------------|
| Unified S-Band Equipment   | Motorola | 01-P09566C001  | E    | EAB - QM   |
| Frequency Multiplier 1A7   |          | 01-P09568C001  | C    | A102       |
| Frequency Multiplier 1A17  |          | 01-P09568C001  | C    | A101       |
| Wide Band Detector 1A4     |          | 01-P09570C001  | D    | A102       |
| Limiter Amplifier ARO01    |          | 01-P09627C001  | None | A111       |
| Limiter Amplifier ARO02    |          | 01-P09627C001  | None | A115       |
| Limiter Amplifier ARO03    |          | 01-P09627C001  | None | A102       |
| Limiter Amplifier ARO06    |          | 01-P09627C001  | None | A104       |
| Divider 19-9.5MC A002      |          | 01-P09632C001  | A    | A102       |
| Buffer Amplif. 9.5MC ARO05 |          | 01-P09635C001  | None | A102       |
| Signal Driver A001         |          | 01-P09644C001  | B    | A102       |
| Ref Driver A003            |          | 01-P09646C001  | B    | A102       |
| Subcarrier Amp. ARO07      |          | 01-P09648C001  | None | A102       |
| Ranging Ampl. ARO04        |          | 01-P09650C001  | A    | A102       |
| Wide Band Detector 1A14    |          | 01-P09570C001  | D    | A101       |
| Limiter Amp. ARO01         |          | 01-P09627C001  | None | A101       |
| Limiter Amp. ARO02         |          | 01-P09627C001  | None | A106       |
| Limiter Amp. ARO03         |          | 01-P09627C001  | None | A109       |
| Limiter Amp. ARO06         |          | 01-P09627C001  | None | A110       |
| Divider 19-9.5MC A002      |          | 01-P09632C001  | A    | A101       |
| Buffer Amp. 9.5MC ARO05    |          | 01-P09635C001  | None | A101       |
| Signal Driver A001         |          | 01-P09644C001  | B    | A101       |
| Ref. Driver A003           |          | 01-P09646C001  | B    | A101       |
| Subcarrier Amp. ARO07      |          | 01-P09648C001  | None | A101       |
| Ranging Amp. ARO04         |          | 01-P09650C001  | A    | A101       |
| Auxiliary Osc. PM 1A9      |          | 01-P09553C001  | H    | A101       |
| Switching Network AG01     |          | 01-P09557C001  | None | A101       |
| Auxiliary Osc. PM 1A19     |          | 01-P09553C001  | H    | A102       |
| Switching Network A001     |          | 01-P09557C001  | None | A103       |
| Voltage Control Osc. 1A8   |          | 01-P09548C001  | F    | A101       |
| Voltage Control Osc 1A18   |          | 01-P09548C001  | F    | A102       |
| Narrow Band Detector 1A2   |          | 01-P09544C001  | E    | A102       |
| Narrow Band Detector 1A12  |          | 01-P09544C001  | E    | A101       |
| IF Amplifier Mixer 1A1     |          | 01-P09540C001  | D    | A102       |
| IF Amplifier Mixer 1A11    |          | 01-P09540C001  | D    | A101       |
| RF Converter 1A3           |          | 01-P09572C001  | E    | A101       |
| RF Converter 1A13          |          | 01-P09572C001  | E    | A104       |
| Pow. Amp/X30 Mult PM 1A10  |          | 01-P09585C001  | H    | A101       |
| Helical Resonator A002     |          | 01-P09658C001  | None | A101       |
| Filter-Power Amp. A001     |          | 01-P09711C001  | None | A101       |
| Freq. Mult X3              |          | 01-P09714C001  | A    | A101       |
| S Band Power Amp.          |          | 01-P09589C001  | F    | A101       |
| Pow. Amp/X30 Mult PM 1A20  |          | 01-P09585C001  | H    | A102       |
| Helical Resonator A002     |          | 01-P09658C001  | None | A102       |
| Filter-Power Amp. A001     |          | 01-P09711C001  | None | A102       |
| Freq. Mult X3              |          | 01-P09714C001  | A    | A102       |
| S Band Power Amp           |          | 01-P09589C001  | F    | A104       |
| Diplexer 1A21              |          | 01-P09602C001  | D    | A102       |
| Power Converter XMTR 1A5   |          | 01-P09577C001  | G    | A101       |
| Regulator A001             |          | 01-P09689C001  | C    | A104       |

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| NOMENCLATURE                  | SUPPLIER      | DWG & PART NO. | REV  | SERIAL NO.            |
|-------------------------------|---------------|----------------|------|-----------------------|
| Unified S-Band Equip. (Cont.) |               |                |      |                       |
| Power Converter XMTR          | Motorola      | 01-P09577C001  | G    | EAB-QM<br>(continued) |
| Regulator                     |               | 01-P09689C001  | C    |                       |
| Power Converter RCVR          |               | 01-P09740C001  | G    |                       |
| Regulator                     |               | 01-P09689C001  | C    |                       |
| Power Converter RCVR          |               | 01-P09740C001  | G    |                       |
| Regulator                     |               | 01-P09689C001  | C    |                       |
| Connector/EMI Box             |               | 01-P09604C001  | G    |                       |
| Cable Assembly W1             |               | 30-P02306D001  | D    |                       |
| Cable Assembly W2             |               | 30-P02306D002  | D    |                       |
| Cable Assembly W3             |               | 30-P02306D003  | D    |                       |
| Cable Assembly W4             |               | 30-P02306D004  | D    |                       |
| Cable Assembly W5             |               | 30-P02306D005  | D    |                       |
| Cable Assembly W6             |               | 30-P02306D006  | D    |                       |
| Cable Assembly W7             |               | 30-P02306D007  | D    |                       |
| Cable Assembly W8             |               | 30-P02306D008  | D    |                       |
| Cable Assembly W9             |               | 30-P02306D009  | D    |                       |
| Cable Assembly W10            |               | 30-P02306D010  | D    |                       |
| Cable Assembly W11            |               | 30-P02306D011  | D    |                       |
| Cable Assembly W12            |               | 30-P02306D012  | D    |                       |
| Cable Assembly W13            |               | 30-P02306D013  | D    |                       |
| Cable Assembly W14            |               | 30-P02306D014  | D    |                       |
| Cable Assembly W15            |               | 30-P02306D015  | D    |                       |
| Cable Assembly W16            |               | 30-P02306D016  | D    |                       |
| Cable Assembly W17            |               | 30-P02306D017  | D    |                       |
| Cable Assembly W18            |               | 30-P02306D018  | D    |                       |
| Cable Assembly W19            |               | 30-P02306D019  | D    |                       |
| Cable Assembly W20            |               | 30-P02306D020  | D    |                       |
| Cable Assembly W21            |               | 30-P02306D021  | D    |                       |
| Cable Assembly W22            |               | 30-P02306D022  | D    |                       |
| Cable Assembly W23            |               | 30-P02306D023  | D    |                       |
| Cable Assembly W24            |               | 30-P02306D024  | D    |                       |
| Cable Assembly W25            |               | 30-P02319D001  | B    |                       |
| Cable Assembly W26            |               | 30-P02307D001  | B    |                       |
| Cable Assembly W27            | 30-P02307D002 | B              |      |                       |
| Cable Assembly W28            | 30-P02318D001 | C              |      |                       |
| Cable Assembly W29            | 30-P02317D001 | B              |      |                       |
| Cable Assembly W30            | 30-P02320D001 | C              |      |                       |
| Cable Assembly W31            | 30-P02321D001 | B              |      |                       |
| Cable Assembly W32            | 30-P02306D025 | D              |      |                       |
| Cable Assembly W33            | 30-P02306D026 | D              |      |                       |
| Wide Band Filter #1           | Peninsula     | Model F1522B   | None | 4                     |
| Wide Band Filter #2           | Peninsula     | Model F1522B   | None | 8                     |

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| NOMENCLATURE                 | SUPPLIER | DWG & PART NO. | REV  | SERIAL NO. |
|------------------------------|----------|----------------|------|------------|
| <b>POWER SUBSYSTEM</b>       |          |                |      |            |
|                              | RCA      |                |      |            |
| CONTROL MODULE               | RCA      | 1759712-502    | AG   | 010        |
| A-1 Fuse Board Assy.         | RCA      | 1759561-501    | G    | 017        |
| A-2 Fuse Board Assy.         | RCA      | 1759561-502    | G    | 019        |
| A-3 C.F. Regulator Board     | RCA      | 1759567-501    | B    | 020        |
| A-4 C.F. Regulator Board     | RCA      | 1759567-501    | B    | 017        |
| A-5 Regulated Buss           | RCA      | 1759570-501    | E    | 015        |
| A-6 Aux. Reg. & Trickle      | RCA      | 1759569-501    | C    | 015        |
| A-7 Shunt Dis. Dr. Telem.    | RCA      | 1759577-501    | F    | 015        |
| A-8 Current, Sens. & Telem.  | RCA      | 1759582-501    | D    | 015        |
| A-9 Harness Assy.            | RCA      | 1849873-501    | E    | 017        |
| A-10 Sw. Bd. Assy.           | RCA      | 1966502-501    | C    | 015        |
| A-11 Diode & Fil. Bd. Assy.  | RCA      | 1966505-501    | C    | 015        |
| A-12 Filter Board Assy.      | RCA      | 1965840-501    | None | 015        |
| A-13 Cap. Assy.              | RCA      | 1768958-501    | B    | 018        |
| A-14 Cap. Assy.              | RCA      | 1768757-501    | B    | 015        |
| A-15 Heat Sink Assy.         | RCA      | 1849560-501    | D    | 015        |
| A-16 Bracket Heat Sink Assy. | RCA      | 1768982-501    | C    | 015        |
| A-17 Filter Assy.            | RCA      | 2263400-501    | G    | 015        |
| Inductor Assy.               | RCA      | 1768483-501    | D    | 015        |
| Inductor Assy.               | RCA      | 1768941-501    | C    | 015        |
| <br>                         |          |                |      |            |
| PAYLOAD REGULATOR MODULE     | RCA      | 1759712-503    | AG   | 011        |
| A-1 Fuse Board Assy.         | RCA      | 1759561-501    | G    | 002        |
| A-2 Fuse Board Assy.         | RCA      | 1759561-502    | G    | 019        |
| A-3 C.F. Regulator Board     | RCA      | 1759567-501    | B    | 018        |
| A-4 C.F. Regulator Board     | RCA      | 1759567-501    | B    | 016        |
| A-5 Regulated Buss           | RCA      | 1759570-501    | E    | 016        |
| A-6 Aux. Reg. & Trickle      | RCA      | 1759569-501    | C    | 016        |
| A-7 Shunt Dis. Dr. Telem.    | RCA      | 1759577-501    | F    | 016        |
| A-8 Current, Sens. & Telem.  | RCA      | 1759582-501    | C    | 016        |
| A-9 Harness Assy.            | RCA      | 1849873-501    | E    | 018        |
| A-10 Sw. Bd. Assy.           | RCA      | 1966502-501    | C    | 016        |
| A-11 Diode & Fil. Bd. Assy.  | RCA      | 1966505-501    | C    | 016        |
| A-12 Filter Board Assy.      | RCA      | 1965840-500    | None | 016        |
| A-13 Cap. Assy.              | RCA      | 1768958-501    | B    | 019        |
| A-14 Cap. Assy.              | RCA      | 1768757-501    | B    | 016        |
| A-15 Heat Sink Assy.         | RCA      | 1849560-501    | D    | 016        |
| A-16 Bracket Heat Sink Assy. | RCA      | 1768982-501    | C    | 016        |
| A-17 Filter Assy.            | RCA      | 2263400-501    | E    | 016        |
| Inductor Assy.               | RCA      | 1768483-501    | D    | 016        |
| Inductor Assy.               | RCA      | 1768941-501    | C    | 016        |
| <br>                         |          |                |      |            |
| SOLAR PLATFORM & ARRAY       | RCA      | 2271152-501    | B    | 102        |
| Platform Motor Drive         | RCA      | 2271118-501    | F    | 101        |
| Motor Mount Subassembly      | RCA      | 2271109-501    | G    | 101        |
| Drive Motor Assy.            | RCA      | 1751589-501    | D    | 113        |
| Motor                        | RCA      | 1751588-1      |      | 101        |
| <br>                         |          |                |      |            |
| SOLAR PLATFORM & ARRAY       | RCA      | 2271152-502    | B    | 102        |
| Platform Motor Drive         | RCA      | 2263808-501    | M    | 104        |
| Motor Mount Subassembly      | RCA      | 1976768-501    | K    | 104        |
| Drive Motor Assy.            | RCA      | 1751589-501    | D    | 112        |
| Motor                        | RCA      | 1751588-1      |      | 033        |

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| <b>NOMENCLATURE</b>         | <b>SUPPLIER</b> | <b>DWG &amp; PART NO</b> | <b>REV</b> | <b>SERIAL NO.</b> |
|-----------------------------|-----------------|--------------------------|------------|-------------------|
| <b>BATTERY MODULE ASSY</b>  | RCA             | 2265943-501              | K          | 57                |
| Electronic Bd.              | RCA             | 1759578-502              | J          | 59                |
| Electronic Bd.              | RCA             | 1849843-502              | G          | 59                |
| Relay & Harness, Bkt. Assy. | RCA             | 1849822-502              | E          | 65                |
| Heat Sink, Wiring Assy.     | RCA             | 1849598-502              | G          | 57                |
| <b>BATTERY MODULE ASSY</b>  | RCA             | 2265943-501              | K          | 58                |
| Electronic Bd.              | RCA             | 1759578-502              | J          | 62                |
| Electronic Bd.              | RCA             | 1849843-502              | G          | 62                |
| Relay & Harness, Bkt. Assy. | RCA             | 1849822-502              | E          | 58                |
| Heat Sink, Wiring Assy.     | RCA             | 1849598-502              | G          | 58                |
| <b>BATTERY MODULE ASSY</b>  | RCA             | 2265943-501              | K          | 59                |
| Electronic Bd.              | RCA             | 1759578-502              | J          | 61                |
| Electronic Bd.              | RCA             | 1849843-502              | G          | 61                |
| Relay & Harness, Bkt. Assy. | RCA             | 1849822-502              | E          | 59                |
| Heat Sink, Wiring Assy.     | RCA             | 1849598-502              | G          | 59                |
| <b>BATTERY MODULE ASSY</b>  | RCA             | 2265943-501              | K          | 60                |
| Electronic Bd.              | RCA             | 1759578-502              | J          | 60                |
| Electronic Bd.              | RCA             | 1849843-502              | G          | 60                |
| Relay & Harness, Bkt. Assy. | RCA             | 1849822-502              | G          | 55                |
| Heat Sing, Wiring Assy.     | RCA             | 1849598-502              | G          | 60                |
| <b>BATTERY MODULE ASSY</b>  | RCA             | 2265943-501              | K          | 61                |
| Electronic Bd.              | RCA             | 1759578-502              | J          | 63                |
| Electronic Bd.              | RCA             | 1849843-502              | G          | 63                |
| Relay & Harness, Bkt. Assy. | RCA             | 1849822-502              | E          | 61                |
| Heat Sink, Wiring Assy.     | RCA             | 1849598-502              | G          | 61                |
| <b>BATTERY MODULE ASSY</b>  | RCA             | 2265943-501              | K          | 62                |
| Electronic Bd.              | RCA             | 1759578-502              | J          | 65                |
| Electronic Bd.              | RCA             | 1849843-502              | G          | 65                |
| Relay & Harness, Bkt. Assy. | RCA             | 1849822-502              | E          | 62                |
| Heat Sink, Wiring Assy.     | RCA             | 1849598-502              | G          | 62                |
| <b>BATTERY MODULE ASSY</b>  | RCA             | 2265943-501              | K          | 63                |
| Electronic Bd.              | RCA             | 1759578-502              | J          | 66                |
| Electronic Bd.              | RCA             | 1849843-502              | G          | 66                |
| Relay & Harness, Bkt. Assy. | RCA             | 1849822-502              | E          | 63                |
| Heat Sink, Wiring Assy.     | RCA             | 1849598-502              | G          | 63                |
| <b>BATTERY MODULE ASSY</b>  | RCA             | 2265943-501              | K          | 64                |
| Electronic Bd.              | RCA             | 1759578-502              | J          | 64                |
| Electronic Bd.              | RCA             | 1849843-502              | G          | 64                |
| Relay & Harness, Bkt. Assy. | RCA             | 1849822-502              | E          | 64                |
| Heat Sink, Wiring Assy.     | RCA             | 1849598-502              | G          | 64                |

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| NOMENCLATURE                    | SUPPLIER  | DWG & PART NO | REV | SERIAL NO. |
|---------------------------------|-----------|---------------|-----|------------|
| VERSATILE INFORMATION PROCESSOR | RADIATION | 607640G10     | B3  | FLT-001    |
| Reprogrammer                    |           | 608141G5      | D1  | 005        |
| Elec. Assy.                     |           | 608140G3      | B   | 0005       |
| Serial Regulator                |           | 520110G2      | C   | 0005       |
| Command Relays                  |           | 520111G4      | D   | 0005       |
| Command Relays                  |           | 520112G2      | C   | 0005       |
| Output Buffer Amplifier         |           | 520113G2      | C1  | 0005       |
| Heat Sink                       |           | 411483G2      | C   | 0005       |
| Digital Multiplexer             |           | 608091G6      | D2  | 005        |
| Elec. Assy.                     |           | 608090G6      | G1  | 0005       |
| Dig. Gates Assy. A1             |           | 520060G2      | A   | 0017       |
| Dig. Gates Assy. A2             |           | 520060G2      | A   | 0018       |
| Dig. Gates Assy. A3             |           | 520060G2      | A   | 0020       |
| Dig. Gates Assy. A4             |           | 520060G2      | A   | 0019       |
| Dig. Sequencer Assy. A5         |           | 520062G2      | A   | 0006       |
| Decoder Matrix A6               |           | 520063G2      | B   | 0005       |
| DC/DC Converter P.S. A7         |           | 520081G1      | A   | 0004       |
| Out. Reg. & T.C. Buffer A8      |           | 520086G1      | A   | 0008       |
| Out. Reg. & T.C. Buffer A9      |           | 520086G1      | A   | 0007       |
| Dig. Add. & Ser. Data A10       |           | 520087G1      | C   | 0008       |
| Dig. Add. & Ser. Data A11       |           | 520087G1      | C   | 0007       |
| Dig. Ctr. & CMD. A12            |           | 520089G2      | B2  | 0006       |
| Dig. Ctr. & CMD A13             |           | 520089G2      | B2  | 0005       |
| Formatter, DC/DC Conv. A14      |           | 520085G1      | A   | 0004       |
| Dig. Interface Buff. A15        |           | 520084G1      | B   | 0008       |
| Dig. Interface Buff. A16        |           | 520084G1      | B   | 0007       |
| Memory Sequencer                |           | 608241G3      | E2  | 005        |
| Elec. Assy.                     |           | 608240G3      | C1  | 0005       |
| Cont & Out Reg Assy A1          |           | 520232G1      | D   | 0008       |
| Funct Gen & Repr Assy A2        |           | 520233G1      | D1  | 0008       |
| Instr Ctr & Comp Assy A3        |           | 520234G2      | D1  | 0008       |
| Cont & Output Reg Assy A4       |           | 520232G1      | D   | 0007       |
| Funct Gen & Repr Assy A5        |           | 520233G1      | D1  | 0007       |
| Instr Ctr & Comp Assy A6        |           | 520234G2      | D1  | 0007       |
| DC/DC Converter Assy A7         |           | 520235G1      | D   | 0004       |
| Memory A                        |           | 608191G9      | D2  | 008        |
| Elec. Assy.                     |           | 608190G9      | F1  | 0008       |
| Section I Assy. A1              |           | 520170G3      | G1  | 0001       |
| Mem. Amp. Assy, Sec I           |           | 520161G4      | E1  | 0018       |
| Memory Array Assy, Sec II       |           | 519218G3      | C   | 0001       |
| Memory Array, Sec. I            |           | 520168G3      | C   | 0014       |
| Mem. Amp. Assy. Sec. I          |           | 520161G4      | D   | 0016       |
| Decode Assy Sec. I & III A2     |           | 520184G1      | D   | 0006       |
| Bit Driver, Sec II A3           |           | 520185G3      | G2  | 0006       |
| B.D. & Data Reg. Sec III A4     |           | 520186G2      | D   | 0006       |
| Decoder, Sec. II A5             |           | 520183G1      | C   | 0006       |
| Assy. Sec. II & III A6          |           | 520171G3      | D2  | 0001       |

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| NOMENCLATURE               | SUPPLIER | DWG & PART NO. | REV | SERIAL NO. |
|----------------------------|----------|----------------|-----|------------|
| V.I.P. (continued)         |          |                |     |            |
| Memory A (continued)       |          |                |     | (008)      |
| Mem. Array Assy, Sec II    |          | 519218G4       | C   | 0004       |
| Mem. Array Sec II          |          | 520168G4       | C   | 0017       |
| Mem. Amp Assy II & III     |          | 520182G2       | D1  | 0006       |
| Mem. Array Assy, Core      |          | 519220G2       | E1  | 0001       |
| Mem. Array Assy, Core      |          | 520169G2       | B   | 0008       |
| DC/DC Converter A7         |          | 520187G1       | C1  | 0007       |
| Memory B                   |          | 608191G10      | D2  | 009        |
| Elec. Assy.                |          | 608190G10      | F1  | 0009       |
| Section I Assy. A1         |          | 520170G3       | G1  | 0002       |
| Mem. Amp. Assy, Sec I      |          | 520161G4       | E1  | 0015       |
| Memory Array Assy, Sec II  |          | 519218G3       | D1  | 0003       |
| Memory Array Sec. I        |          | 520168G3       | C   | 0016       |
| Mem. Amp. Assy. Sec. I     |          | 520161G4       | E1  | 0017       |
| Decode Assy Sec I & II A2  |          | 520184G1       | E1  | 0007       |
| Bit Driver, Sec II A3      |          | 520185G3       | G2  | 0007       |
| B.D. & Data Reg Sec II A4  |          | 520186G2       | D   | 0007       |
| Decoder, Sec. II A5        |          | 520183G1       | C   | 0007       |
| Assy. Sec. II & III A6     |          | 520171G3       | D2  | 0002       |
| Mem. Array Assy, Sec II    |          | 519218G4       | D1  | 0005       |
| Mem. Array, Sec II         |          | 520168G4       | C   | 0018       |
| Mem. Amp. Assy, II & III   |          | 520182G2       | D1  | 0007       |
| Mem. Array Assy, Core      |          | 519220G2       | E1  | 0002       |
| Mem. Array Assy, Core      |          | 520169G2       | B   | 0009       |
| DC/DC Converter A7         |          | 520187G1       | C1  | 0008       |
| Analog Multiplexer         |          | 608041G5       | D1  | 005        |
| Elec. Assy.                |          | 608040G3       | E1  | 0005       |
| Coder. Analog Assy A1      |          | 520033G1       | E2  | 0007       |
| DC/DC Conv. Card Assy. A2  |          | 520034G1       | B2  | 0008       |
| DC/DC Conv. Card Assy. A3  |          | 520034G1       | B2  | 0007       |
| Coder Analog Assy. A4      |          | 520033G1       | E2  | 0008       |
| Analog Matrix Assy. A5     |          | 520031G1       | A   | 0008       |
| DC/DC Conv. & pwr. Assy A6 |          | 520032G1       | C1  | 0004       |
| Analog Matrix Assy. A7     |          | 520031G1       | A   | 0007       |
| Analog Gates Assy. A8      |          | 520030G1       | B   | 0055       |
| Analog Gates Assy. A9      |          | 520030G1       | B   | 0030       |
| Analog Gates Assy. A10     |          | 520030G1       | B   | 0032       |
| Analog Gates Assy. A11     |          | 520030G1       | B   | 0036       |
| Analog Gates Assy. A12     |          | 520030G1       | B   | 0035       |
| Analog Gates Assy. A13     |          | 520030G1       | B   | 0034       |
| Analog Gates Assy. A14     |          | 520030G1       | B   | 0031       |
| Analog Gates Assy. A15     |          | 520030G1       | B   | 0029       |
| Analog Gates Assy. A16     |          | 520030G1       | B   | 0028       |

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| NOMENCLATURE                 | SUPPLIER        | DWG & PART NO | REV  | SERIAL NO.  |
|------------------------------|-----------------|---------------|------|-------------|
| MMCA                         | Ithaco          | D40634G4      | C    | NEF-EAB-FT3 |
| Al Card                      |                 | D40614G1      | A    | 11650       |
| Al Card                      |                 | D40615G1      | A    | 11653       |
| Orbit Adjust Subsystem       | Rkt.Rsrch       | 26058-9       | D    | FT3         |
| Thruster Assembly            |                 | 25111-49      | L    | 319         |
| Thruster Assembly            |                 | 25111-49      | L    | 325         |
| Thruster Assembly            |                 | 25111-59      | L    | 304A        |
| Trans. Box & Connector       |                 | 24949-5       | F    | 103         |
| Attitude Measurement Sensor  | Quantic         | 51877-01      | D    | FT2         |
| IR Telescope Assembly        |                 | 51788-01      | G    | 003         |
| Housing Assembly             |                 | 51903-01      | E    | 003         |
| Objective Lens Assembly      |                 | 51791-01      | C    | 003         |
| Filter Assembly              |                 | 51797-01      | A    | 003         |
| Heat Sink Assembly           |                 | 51807-01      | C    | 003         |
| Chopper Board Assembly       |                 | 51878-01      | E    | 005         |
| Signal Board - Lower         |                 | 51849-01      | B    | 004         |
| Signal Board - Upper         |                 | 51853-01      | B    | 004         |
| Signal Board Assembly        |                 | 51909-01      | C    | 004         |
| Connector Assembly           |                 | 51907-01      | C    | 004         |
| DC-DC Converter Bd. Assembly |                 | 51873-01      | E    | 004         |
| Regulator Board Assembly     |                 | 51883-01      | G    | 004         |
| Output Board Assembly        |                 | 51890-01      | C    | 004         |
| WIDEBAND POWER AMP. #1       | Watkins-Johnson | 612970        | E    | FT4         |
| Traveling Wave Tube          | "               | 612965        | B    | 11          |
| LV Pwr Supply Assy.          | "               | 612982        | B    | 405         |
| Card Ass'y No. 1, LV         | "               | 612984        | B    | 405         |
| Card Ass'y No. 2, LV         | "               | 612986        | B    | 405         |
| HV Pwr Supply Ass'y          | "               | 612980        | D    | 405         |
| Card Ass'y No. 1, HV         | "               | 612997        | B    | 305         |
| Card Ass'y No. 2, HV         | "               | 612999        | B    | 305         |
| Card Ass'y Turn-On Con.      | "               | 612944        | B    | 405         |
| Cable Ass'y, RF              | "               | 612977        | B    | 39          |
| Cable Ass'y, RF              | "               | 612978        | B    | 26          |
| Cable Ass'y, RF              | "               | 612979        | B    | 22          |
| Thermistor                   | "               | 612957        | None | 10          |



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| NOMENCLATURE                 | SUPPLIER        | DWG & PART NO. | REV  | SERIAL NO. |
|------------------------------|-----------------|----------------|------|------------|
| WIDEBAND POWER AMPLIFIER #2  | Watkins-Johnson | 612970         | E    | FT3        |
| Traveling Wave Tube          | "               | 612965         | B    | 8          |
| LV Pwr Supply Ass'y          | "               | 612982         | B    | 404        |
| Card Ass'y No. 1, LV         | "               | 612984         | B    | 404        |
| Card Ass'y No. 2, LV         | "               | 612986         | B    | 404        |
| HV Pwr Supply Ass'y          | "               | 612980         | D    | 404        |
| Card Ass'y No. 1, HV         | "               | 612997         | B    | 404        |
| Card Ass'y No. 2, HV         | "               | 612999         | B    | 404        |
| Card Ass'y Turn-On Con.      | "               | 612944         | B    | 404        |
| Cable Ass'y, RF              | "               | 612977         | B    | 38         |
| Cable Ass'y, RF              | "               | 612978         | B    | 27         |
| Cable Ass'y, RF              | "               | 612979         | B    | 23         |
| Thermistor                   | "               | 612957         | None | 006        |
| PCM TLM RECORDER #1          | Leach           | 202835-001     | B    | EAB-QM1    |
| Preamp, Digital              | Leach           | 202911-001     | B    | 911001     |
| Repr & Erase Con, Rec Logic  | Leach           | 202915-001     | B    | 915002     |
| Amplifier, Record/Repr.      | Leach           | 202920-001     | B    | 920001     |
| Motor Drive & Telemetry      | Leach           | 202925-001     | B    | 925001     |
| Transport Group Subass'y     | Leach           | 202930-001     | A    | 930001     |
| Lt. Source & Sensor Ass'y    | Leach           | 202932-001     | None | 932001     |
| Electronic Switch, Mtr Invt. | Leach           | 202965-001     | None | 965001     |
| Electronic Switch, Mtr Invt. | Leach           | 202965-001     | None | 965002     |
| Power Supply                 | Leach           | 202966-001     | None | 966001     |
| Vtg Reg & Current Telemetry  | Leach           | 202973-001     | A    | 973001     |
| Filter, EOT Backup           | Leach           | 11-16195       | A    | 195001     |
| Magnetic Tape                | Leach           | 1/4 - 551      | None | 508        |
| PCM TLM RECORDER #2          | Leach           | 202835-001     | B    | EAB-FT4    |
| Preamp, Dig Repr & Erase     | Leach           | 202911-001     | B    | 911005     |
| Control, Recorder Logic      | Leach           | 202915-001     | B    | 915001     |
| Amplifier, Record/Repr.      | Leach           | 202920-001     | B    | 920005     |
| Motor Drive & Telemetry      | Leach           | 202925-001     | B    | 925005     |
| Transport Group Subass'y     | Leach           | 202930-001     | B    | 930005     |
| Lt. Source & Sensor Ass'y    | Leach           | 202932-001     | None | 932005     |
| Electronic Switch, Mtr Invt. | Leach           | 202965-001     | None | 965009     |
| Electronic Switch, Mtr Invt. | Leach           | 202965-001     | None | 965010     |
| Power Supply                 | Leach           | 202966-001     | None | 966005     |
| Vtg Reg & Current Telemetry  | Leach           | 202973-001     | A    | 973005     |
| Filter, EOT Backup           | Leach           | 11-16195       | A    | 195005     |
| Magnetic Tape                | Leach           | 1/4 - 551      | None | 510        |

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| NOMENCLATURE                | SUPPLIER | DWG & PART NO. | REV  | SERIAL NO. |
|-----------------------------|----------|----------------|------|------------|
| COMMAND CLOCK SUBASSEMBLY   | Calcomp  | 20001-102-301  | None | EAB-FT2    |
| Motor Drive Ass'y           | Calcomp  | 10812-502-000  | 3    | F013       |
| Frequency Amplifier Ass'y 1 | Calcomp  | 10814-502-111  | 7    | F013       |
| Time Code Ass'y             | Calcomp  | 10816-502-000  | 3    | F015       |
| Frequency Amplifier Ass'y 2 | Calcomp  | 10818-502-201  | None | F013       |
| Comstor Memory Ass'y        | Calcomp  | 10820-502-000  | 4    | F013       |
| Comstor Logic Ass'y         | Calcomp  | 10822-502-000  | 1    | F013       |
| Comdec Ass'y                | Calcomp  | 20438-502-000  | 1    | F013       |
| Telemetry Ass'y             | Calcomp  | 10826-502-000  | 4    | F013       |
| Matrix Ass'y                | Calcomp  | 10828-502-000  | 5    | F013       |
| Power Supply #1             | Calcomp  | 10830-502-201  | None | F014       |
| Power Supply #2             | Calcomp  | 10832-502-101  | 6    | F013       |
| Oscillator (A)              | Calcomp  | 10003-502      |      | F016       |
| Oscillator (B)              | Calcomp  | 10003-502      |      | F015       |
| INTERFACE SWITCHING MODULE  | Calcomp  | 20002-102      | 1    | EAB-FT2    |
| Relay Network No. 2B        | Calcomp  | 10326-502-100  | 3    | F3011      |
| Relay Network No. 1         | Calcomp  | 10323-502-000  | 3    | F3011      |
| Relay Network No. 1         | Calcomp  | 10323-502-000  | 3    | F3012      |
| Relay Network No. 2B        | Calcomp  | 10326-502-100  | 3    | F3012      |
| Resistor Network            | Calcomp  | 20431-502-000  | 1    | F3004      |
| Relay Network No. 1         | Calcomp  | 10323-502-000  | 3    | F3013      |
| Relay Network No. 2B        | Calcomp  | 10326-502-100  | 3    | F3014      |
| Resistor Network            | Calcomp  | 20431-502-000  | 1    | F3006      |
| Relay Network No. 4B        | Calcomp  | 10475-502-000  | 2    | F3006      |
| Relay Network No. 2B        | Calcomp  | 10326-502-100  | 3    | F3015      |
| Relay Network No. 1         | Calcomp  | 10323-502-000  | 3    | F3015      |
| Relay Network No. 1         | Calcomp  | 10323-502-000  | 3    | F3014      |
| Cable No. 1 - Jumper        | Calcomp  | 10111-401-000  | 4    | F3007      |
| Cable No. 1 - Jumper        | Calcomp  | 10111-401-000  | 4    | F3008      |
| Cable No. 1 - Jumper        | Calcomp  | 10111-401-000  | 4    | F3009      |
| Cable No. 2 - Jumper        | Calcomp  | 10110-401-000  | 2    | F3012      |
| Cable No. 2 - Jumper        | Calcomp  | 10110-401-000  | 2    | F3006      |
| Cable No. 2 - Jumper        | Calcomp  | 10110-401-000  | 2    | F3007      |
| Cable No. 2 - Jumper        | Calcomp  | 10110-401-000  | 2    | F3005      |
| Cable No. 4 - Jumper        | Calcomp  | 10146-401-000  | 3    | F3002      |
| Cable No. 6 - Jumper        | Calcomp  | 10269-401-000  | 5    | F3006      |
| Cable No. 6 - Jumper        | Calcomp  | 10269-401-000  | 5    | F3005      |
| Cable No. 9 - Jumper        | Calcomp  | 20205-401-000  | None | F3006      |
| Cable No. 9 - Jumper        | Calcomp  | 20205-401-000  | None | F3005      |

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| NOMENCLATURE                  | SUPPLIER | DWG & PART NO. | REV   | SERIAL NO. |
|-------------------------------|----------|----------------|-------|------------|
| Attitude Control System       | GE-SS    | 47E213514G2    | AN-10 | 114        |
| Telemetry Conversion Module   | GE-SS    | 238R405G2      |       | 6549356    |
| Structure/Thermal Subsystem   | FHC      | 831-11-1000-1  | A     | FT4        |
| Louver, Ht. Shld, & Supt.     | FHC      | 831-11-0300-11 | D     | 6          |
| Louver Support Assembly       | FHC      | 831-11-0301-21 | G     | 6          |
| Heat Shield Assembly          | FHC      | 831-11-0306-31 | K     | 6          |
| Louver Assembly               | FHC      | 831-11-0120-31 | B     | 6          |
| Temperature Sensing Inst.     | FHC      | 831-11-0142-21 | G     | 6          |
| Albedo Shield, Left           | FHC      | 831-11-0210-61 | C     | 6          |
| Albedo Shield, Right          | FHC      | 831-11-0210-62 | C     | 6          |
| Temperature Sensing Inst.     | FHC      | 831-11-0142-31 | G     | 6          |
| Pitch Reaction Wheel          | Bendix   | X1903155-2     | D     | EAB-FT-02R |
| Wheel, Hub, & Rotor Ass'y.    | Bendix   | X1875403-1     | A     | 202        |
| Shaft & Stator Assembly       | Bendix   | X1875402-1     | B     | 203        |
| Shaft, Final Machining        | Bendix   | X1875404-1     | B     | 203        |
| Motor Rotor                   | Bendix   | X1877013-1     | A     | 208        |
| Motor Stator                  | Bendix   | X1877036-1     | C     | 7107003    |
| Yaw Reaction Wheel            | Bendix   | X1898720-2     | D     | EAB-FT-02R |
| Flywheel & Rotor Assembly     | Bendix   | X1898721-1     | C     | 202        |
| Housing & Closure Mach.Asy.   | Bendix   | X1891422-1     | C     | 201        |
| Motor Stator                  | Bendix   | X1877036-1     | C     | 7107002    |
| Bearing Sleeve                | Bendix   | X1898717-1     | A     | 202        |
| Shouldered Shaft              | Bendix   | X1898730-1     | B     | 202        |
| Labyrinth Seal                | Bendix   | X1898728-1     | None  | 204        |
| Locking Ring                  | Bendix   | X1898729-1     | B     | 202        |
| Control Logic Box             | Ithaco   | D40778G2       | C     | FT-10      |
| A1 Card                       | Ithaco   | D40721G1       | D     | 11619      |
| A2 Card                       | Ithaco   | D40752G1       | C     | 11621      |
| A3 Card                       | Ithaco   | D40753G1       | C     | 11622      |
| A4 Card                       | Ithaco   | D40754G1       | C     | 15036      |
| A5 Card                       | Ithaco   | D40755G1       | D     | 11626      |
| A6 Card                       | Ithaco   | D40253G2       | D     | 11615      |
| A7 Card                       | Ithaco   | D40253G2       | D     | 11616      |
| A8 Card                       | Ithaco   | D40728G1       | D     | 11628      |
| A9 Card                       | Ithaco   | D40179G2       | F     | 11524      |
| RRWS/Signal Processor Asy. #1 | Ithaco   | D40770G3       | D     | FT-14      |
| Signal Processor              | Ithaco   | D40769G3       | B     | 11629      |
| A1 Card                       | Ithaco   | C30302G2       | I     | 11676      |
| A2 Card                       | Ithaco   | C31066G1       | C     | 11659      |
| A3 Card                       | Ithaco   | C31167G1       | B     | 11669      |
| Roll Reaction Wheel Scanner   | Bendix   | X1871380-2     |       |            |

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| NOMENCLATURE                   | SUPPLIER | DWG & PART NO | REV  | SERIAL NO. |
|--------------------------------|----------|---------------|------|------------|
| Attitude Control System (cont) |          |               |      |            |
| RRWS/Signal Processor Asy.#2   | Ithaco   | D40770G4      | D    | FT-15      |
| Signal Processor               | Ithaco   | D40769G4      | B    | 11640      |
| A1 Card                        | Ithaco   | C30302G2      | I    | 11677      |
| A2 Card                        | Ithaco   | C31066G1      | C    | 11660      |
| A3 Card                        | Ithaco   | C31167G1      | B    | 11670      |
| Roll Reaction Wheel Scanner    | Bendix   | X1871380-2    |      |            |
|                                |          |               |      |            |
| Pneumatics Subsystem           | TRW      | 113580        | E1   | 008        |
| Solenoid Valves                |          |               |      |            |
| + Pitch                        |          | PT2-3030-1    | G    | 17         |
| - Pitch                        |          | PT2-3030-1    | G    | 18         |
| + Roll                         |          | PT2-3030      | G    | 33         |
| - Roll                         |          | PT2-3030      | G    | 24         |
| + Yaw                          |          | PT2-3030      | G    | 34         |
| - Yaw                          |          | PT2-3030      | G    | 32         |
| Supt. Nozzle Tube Assemblies   |          |               |      |            |
| + Yaw                          |          | 116599-5      | C    | 074        |
| - Yaw                          |          | 116599-6      | C    | 076        |
| + Yaw                          |          | 113586-5      | C    | 069        |
| - Yaw                          |          | 113586-6      | C    | 072        |
| Nozzles                        |          |               |      |            |
| + Pitch                        |          | 113591-3      | B    | 011        |
| - Pitch                        |          | 113591-3      | B    | 013        |
| + Roll                         |          | 113593-3      | B4   | 014        |
| - Roll                         |          | 113593-3      | B4   | 025        |
| + Yaw                          |          | 113593-3      | B4   | 018        |
| - Yaw                          |          | 113593-3      | B4   | 016        |
| + Yaw                          |          | 113593-3      | B4   | 020        |
| - Yaw                          |          | 113593-3      | B4   | 023        |
| Regulator                      |          | PT2-3032      | E    | 05         |
| Low Pressure Transducer        |          | PT2-3068      | C    | 88         |
| High Pressure Transducer       |          | PT2-3033-1    | F    | 1004       |
| Gas Temperature Transducer     |          | PT2-3083      | B    | 0004       |
| Manifold Temp. Transducer      |          | PT2-3035-2    | F    | 0004       |
| Pressure Vessel                |          | C113441-2     | A4   | 12         |
| Fill Valve                     |          | C263256-1     | E1   | 28485-2    |
| Manifold                       |          | 113582-3      | F1   | 008        |
| Mounting Platform              |          | 113581-7      | E2   | 008        |
| LLPS Filter                    |          | C120631-1     | None | 008        |
| Junction Box                   |          | 233586-5      | D3   | 008        |
|                                |          |               |      |            |
| Initiation Timer               | GE-SS    | 47E221985G1   | AN-9 | 6549484    |

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| NOMENCLATURE                    | SUPPLIER | DWG & PART NO  | REV  | SERIAL NO. |
|---------------------------------|----------|----------------|------|------------|
| Attitude Control System (cont.) |          |                |      |            |
| Solar Array Drive, RH           | TRW      | E246623-7      |      | FT04       |
| A1 Electronics                  |          | E235406-4      | J3   | FT01       |
| A2 Electronics                  |          | E235397-4      | G2   | FT01       |
| Wobble Gear                     |          | 233773-3       | E5   | FT06       |
| Motor                           |          | 264666         | A2*  | 13, 23     |
| Sun Sensor                      |          | E242143-1      | C2   | FT23, FT24 |
| Voltage Regulator               |          | E250692-1      | D2   | FT08       |
| Transducer                      |          | PT2-3039       | C    | 1009       |
| Potentiometer                   |          | PT2-3040       | A    | 684891     |
| Slip Ring                       |          | C232457-1      | B1   | 9          |
| Solar Array Drive, LH           | TRW      | E246623-7      |      | FT-005F    |
| A1 Electronics                  |          | E235406-4      | J3   | 005        |
| A2 Electronics                  |          | E235397-4      | G2   | 005F       |
| Wobble Gear                     |          | 233773-3       | E5   | R005       |
| Motor                           |          | 264666         | A2   | 4          |
| Sun Sensor                      |          | E242143-1      | B5   | 003F, 004F |
| Voltage Regulator               |          | E250692-1      | A    | 005        |
| Transducer                      |          | PT2-3039       | C    | 1016       |
| Potentiometer                   |          | PT2-3040       | A    | 216583     |
| Slip Ring                       |          | C232457-1      | B1   | 008        |
| Rate Measuring Package A        | Sperry   | 4310-90641-905 | G    | FT08       |
| Rate Loop Elect. Card           | Sperry   | 4216-67676     | F    | 13         |
| Power Conditioning Card         | Sperry   | 4331-91544     | A    | 20         |
| Heater Controller Card          | Sperry   | 4216-67678     | K    | 13         |
| Telem. Sig. Cond. Card          | Sperry   | 4216-67679     | I    | 15         |
| Relay Card A                    | Sperry   | 4331-91545     | None | 20         |
| Relay Card B                    | Sperry   | 4216-67681     | C    | 20         |
| Inverter Subassembly            | Sperry   | 4331-91579     | None | 16         |
| RFI Assembly                    | Sperry   | 4310-90627     | C    | 15         |
| RMP Cable Harness               | Sperry   | 4216-90956-2   | F    | 15         |
| Gyro, Rate Integrating          | Northrop | P/N 67516      | None | N8         |
| Normalization Assembly          | Sperry   | 4331-91578     | None | 18         |
| Rate Measuring Package B        | Sperry   | 4310-90641-903 | E    | NIM-D-FT03 |
| Rate Loop Elect. Card           | Sperry   | 4216-67676     | E    | 6A         |
| Power Conditioning Card         | Sperry   | 4216-67677     | F    | 6A         |
| Heater Controller Card          | Sperry   | 4216-67678     | J    | 6A         |
| Telem. Sig. Cond. Card          | Sperry   | 4216-67679     | G    | 6A         |
| Relay Card A                    | Sperry   | 4310-90848     | None | 6A         |
| Relay Card B                    | Sperry   | 4310-90841     | A    | 6A         |
| Inverter Subassembly            | Sperry   | 4310-90633     | F    | 6A         |
| RFI Assembly                    | Sperry   | 4310-90627     | A    | 6A         |
| RMP Cable Harness               | Sperry   | 4216-90956-2   | D    | 6A         |
| Gyro, Rate Integrating          | Sperry   | 1200941        | D    | 11         |
| Normalization Assembly          | Sperry   | 4310-90843     | F    | 11         |

\* E.O. A1 Not Incorporated

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| NOMENCLATURE                   | SUPPLIER | OWG & PART NO. | REV   | SERIAL NO.  |
|--------------------------------|----------|----------------|-------|-------------|
| Attitude Control System (cont) |          |                |       |             |
| Yaw Rate Gyro                  | Northrop | 63861-302      | J     | FT3         |
| Choke, Module                  |          | 63880-301      | C     | 102         |
| Transformer, Module            |          | 63881-301      | C     | 102         |
| Thermistor, Module             |          | 63866-302      | E     | 104         |
| Gyroscope, Rate                |          | 79142-301      | E     | D-975       |
| P.C. Component Board           |          | 63876-302      | H     | N3          |
| P.C. Component Board           |          | 63877-302      | G     | N3          |
| P.C. Component Board           |          | 63878-302      | J     | N3          |
| P.C. Component Board           |          | 63879-302      | H     | N3          |
| Package Assembly               |          | 63843-302      | M     | NEF/EAB-FT3 |
| Component Board                |          | 63844-302      | E     | N3          |
|                                |          |                |       |             |
| Paddle Damper, RH              | GE-SS    | 248E126G4      | AN-19 | 6549641     |
| Paddle Damper, LH              | GE-SS    | 248E126G4      | AN-19 | 6549642     |
|                                |          |                |       |             |
| Wideband Antenna #1            | GE-SS    | 47D222340G1    | -4    | 6549589     |
| Wideband Antenna #2            | GE-SS    | 47D222340G1    | -4    | 6549588     |
| DCS Antenna                    | GE-SS    | 47D210564G3    | -6    | 6549518     |
| Command Antenna                | GE-SS    | 113C7468G1     | -3    | 6549515     |
| S-Band Antenna                 | GE-SS    | 111C2955G5     | -8    | 6549365     |
| Quadraloop Antenna #1          | GE-SS    | 248E754G8      | -6    | 6549494     |
| #2                             | GE-SS    | 248E754G8      | -6    | 6549495     |
| #3                             | GE-SS    | 248E754G8      | -6    | 6549496     |
| #4                             | GE-SS    | 248E754G8      | -6    | 6549497     |

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| NOMENCLATURE              | SUPPLIER  | DWG & PART NO | REV  | SERIAL NO. |
|---------------------------|-----------|---------------|------|------------|
| VHF TRANSMITTER           | RADIATION | 613202G1      | A1   | FT0004     |
| Electrical Assembly       |           | 613205G1      | None | 0003       |
| RF Transmitter Assenbly   |           | 613203G1      | B2   | 0003       |
| Oscillator/Buffer A1      |           | 529611G1      | A5   | 0004       |
| Phase Modulator A2        |           | 529738G1      | A2   | 0003       |
| Limiter Tripler A3        |           | 529612G1      | A7   | 0004       |
| Driver Amplifier A4       |           | 418053G1      | A7   | 0007       |
| 300 MV Amplifier A5       |           | 529609G1      | A5   | 0007       |
| 2 W Amplifier A6          |           | 529610G1      | A7   | 0005       |
| Output Filter A7          |           | 418054G1      | A4   | 0008       |
| Oscillator/Buffer A8      |           | 529611G1      | A5   | 0006       |
| Phase Modulator A9        |           | 529738G1      | A2   | 0006       |
| Limiter Tripler A10       |           | 529612G1      | A7   | 0007       |
| Driver Amplifier A11      |           | 418053G1      | A7   | 0008       |
| 300 MV Amplifier A12      |           | 529609G1      | A5   | 0008       |
| 2 W Amplifier A13         |           | 529610G1      | A7   | 0009       |
| Output Filter A14         |           | 418054G1      | A4   | 0007       |
| Isolator A15              |           | 115479-102    | NA   | 10         |
| Power Reg. Elec. Assembly |           | 613209G1      | A    | 0003       |
| Power Regulator           |           | 529615G1      | A2   | 0004       |
| Filter Modulor            |           | 529732G1      | A2   | 0003       |

GOVERNMENT FURNISHED EQUIPMENT

|                               |        |             |   |       |
|-------------------------------|--------|-------------|---|-------|
| Return Beam Vidicon           | RCA    | 2265041-501 |   |       |
| Camera Sensor (Blue) #2       | RCA    | 1976477-501 |   | 004   |
| Camera Sensor (Yellow) #1     | RCA    | 1976477-502 |   | 003   |
| Camera Sensor (Red) #3        | RCA    | 1976477-503 |   | 008   |
| Camera Cont./Combiner         | RCA    | 2265336-501 |   | 003   |
| Camera Electronics #1         | RCA    | 1976466-501 |   | 003   |
| Camera Electronics #2         | RCA    | 1976466-501 |   | 004   |
| Camera Electronics #3         | RCA    | 1976466-501 |   | 008   |
| Wide Band Video Tape Recorder | RCA    | 202835-001  |   |       |
| Transport Unit 1              | RCA    | 8358497-501 |   | FLT2  |
| Transport Unit 2              | RCA    | 8358497-501 |   | FLT6  |
| Electronics Unit 1            | RCA    | 8370323-501 |   | FLT2  |
| Electronics Unit 2            | RCA    | 8370323-501 |   | FLT 6 |
| Multi Spectral Scanner System | Hughes | 3241000-100 |   | 002   |
| Multiplexer                   | Hughes | 3241140-100 |   | 001   |
| Scanner                       | (SBRC) | 43727       |   | 002   |
| MSS Line Filter               | Hughes | 3241160-100 |   | 004   |
| ECAM                          | GSFC   | GF1308902   | 2 | P-FLT |

**APPENDIX B**  
**COMMAND MATRIX**



Table B-1. LANDSAT-2 Commands

| <u>CMD #</u> | <u>Command Function</u>     | <u>CMD #</u> | <u>Command Function</u>          |
|--------------|-----------------------------|--------------|----------------------------------|
| 000          | Spare (Clock)               | 035          | Select Red Freq. Generator       |
| 001          | Pri COMSTOR On & Fill       | 036          | Spare (Clock)                    |
| 002          | Spare (Clock)               | 037          | Spare (Clock)                    |
| 003          | Pri COMSTOR Verify          | 040          | Pneumatics Enable                |
| 004          | Pri COMSTOR Copy            | 041          | 0.3° Yaw Position Bias Enable    |
| 005          | Pri COMSTOR Off             | 042          | Pneu Interlock Bypass Disable    |
| 006          | Pri COMSTOR Activate        | 043          | Spare                            |
| 007          | Serial Data Transfer On     | 044          | Pneu Low Voltage Interlock Reset |
| 010          | CMD Execution Counter Reset | 045          | Differential Tach Disable        |
| 011          | Select Pri Matrix Decoder   | 046          | WBPA 2 Power On                  |
| 012          | Select Pri Matrix A Drivers | 047          | WBPA 2 Select 10W Output         |
| 013          | Select Pri Matrix B Drivers | 050          | APU Standby Mode                 |
| 014          | Select Pri Oscillator       | 051          | ECAM Load                        |
| 015          | Select Pri Freq. Generator  | 052          | MSS System On                    |
| 016          | Spare (Clock)               | 053          | MSS Select Inverter A            |
| 017          | Load Time Code              | 054          | MSS Select Band 1 High Voltage A |
| 020          | Non-Keyed PS/COMDECS Off    | 055          | MSS Select Band 2 High Voltage A |
| 021          | Red COMSTOR On & Fill       | 056          | MSS Select Band 3 High Voltage A |
| 022          | Spare (Clock)               | 057          | MSS Band 1 On                    |
| 023          | Red COMSTOR Verify          | 060          | 0.3° Yaw Position Bias Disable   |
| 024          | Red COMSTOR Copy            | 061          | Pneumatics Disable               |
| 025          | Red COMSTOR Off             | 062          | Spare                            |
| 026          | Red COMSTOR Activate        | 063          | Pneu Interlock Bypass Enable     |
| 027          | Spare (Clock)               | 064          | Differential Tach Enable         |
| 030          | Spare (Clock)               | 065          | ECAM Execute                     |
| 031          | Select Red Matrix Decoder   | 066          | Spare                            |
| 032          | Select Red Matrix A Drivers | 067          | WBPA 2 Power Off                 |
| 033          | Select Red Matrix B Drivers | 070          | Spare                            |
| 034          | Select Red Oscillator       | 071          | APU Normal Mode                  |

Table B-1. LANDSAT-2 Commands (Cont'd)

| <u>CMD #</u> | <u>Command Function</u>          | <u>CMD #</u> | <u>Command Function</u>        |
|--------------|----------------------------------|--------------|--------------------------------|
| 072          | MSS Select Inverter B            | 127          | USB Ranging On                 |
| 073          | MSS System Off                   | 130          | USB Modulation Input Crossed   |
| 074          | MSS Select Band 2 High Voltage B | 131          | Spare                          |
| 075          | MSS Select Band 1 High Voltage B | 132          | MSS Band 2 Off                 |
| 076          | MSS Band 1 Off                   | 133          | Spare (MSS)                    |
| 077          | MSS Select Band 3 High Voltage B | 134          | MSS Band 4 Off                 |
| 100          | Differential Tach Normal Gain    | 135          | MSS Band 3 Off                 |
| 101          | 0.1° Yaw Position Bias Enable    | 136          | MSS Select Calibration Lamp B  |
| 102          | RLNA into Yaw Disable            | 137          | Spare (MSS)                    |
| 103          | 2.9° Pitch Position Bias Enable  | 140          | Roll Unload Disable            |
| 104          | Pitch Momentum Bias Disable      | 141          | Negative Yaw Position Bias     |
| 105          | ECAM Run A                       | 142          | Yaw Wheel Disable              |
| 106          | WBPA 2 Select 20W Output         | 143          | Spare                          |
| 107          | USB Bypass Aux Oscillator        | 144          | Pitch Unload Disable           |
| 110          | USB Select Transmitter B         | 145          | Positive Pitch Position Bias   |
| 111          | Spare                            | 146          | USB Ranging Off                |
| 112          | MSS High Voltage On              | 147          | USB Modulation Input Normal    |
| 113          | MSS Band 2 On                    | 150          | USB Enable Aux Oscillator      |
| 114          | MSS Band 3 On                    | 151          | Spare                          |
| 115          | MSS Band 4 On                    | 152          | MSS Rotating Shutter Driver On |
| 116          | Spare (MSS)                      | 153          | MSS Scan Monitor On            |
| 117          | MSS Select Calibration Lamp A    | 154          | MSS Band 1 High Gain           |
| 120          | 0.1° Yaw Position Bias Disable   | 155          | MSS Band 2 High Gain           |
| 121          | Differential Tach High Gain      | 156          | MSS Calibration Lamp On        |
| 122          | 2.9° Pitch Position Bias Disable | 157          | MSS Band 1 High Voltage On     |
| 123          | RLNA into Yaw Enable             | 160          | Positive Yaw Position Bias     |
| 124          | Negative Pitch Position Bias     | 161          | Roll Unload Enable             |
| 125          | Pitch Momentum Bias Enable       | 162          | Pneumatics Momentary Enable    |
| 126          | USB Select Transmitter A         | 163          | Yaw Wheel Enable               |

Table B-1. LANDSAT-2 Commands (Cont'd)

| <u>CMD #</u> | <u>Command Function</u>          | <u>CMD #</u> | <u>Command Function</u>          |
|--------------|----------------------------------|--------------|----------------------------------|
| 164          | ECAM Run B                       | 222          | 400 RPM Interlock Disable        |
| 165          | Pitch Unload Enable              | 223          | Rate Measuring Package B Enable  |
| 166          | VHF Xmtr Playback Mode 2         | 224          | Spare                            |
| 167          | VHF Xmtr Power 1 Off             | 225          | Yaw Normal Mode                  |
| 170          | VHF Xmtr Power 2 On              | 226          | Spare                            |
| 171          | VHF Xmtr Playback Override Off   | 227          | VHF Xmtr High Power Mode         |
| 172          | MSS Scan Monitor Off             | 230          | VHF Xmtr Playback Override On    |
| 173          | MSS Rotating Shutter Driver Off  | 231          | VHF Select Xmtr A                |
| 174          | MSS Band 2 Low Gain              | 232          | MSS Band 3 High Voltage Off      |
| 175          | MSS Band 1 Low Gain              | 233          | MSS Band 2 High Voltage Off      |
| 176          | MSS Band 1 High Voltage Off      | 234          | Spare (MSS)                      |
| 177          | MSS Calibration Lamp Off         | 235          | MSS Sel Shutter Monitor Source B |
| 200          | Orbit Adjust Mode Enable         | 236          | MSS Scanner Power Line 2         |
| 201          | ECAM On                          | 237          | Spare (MSS)                      |
| 202          | Rate Measuring Package A Enable  | 240          | TMP Select Memory Unit A         |
| 203          | 400 RPM Interlock Enable         | 241          | Spare                            |
| 204          | Yaw Acquisition Mode             | 242          | TMP Select Memory Sequencer A    |
| 205          | Spare                            | 243          | Spare                            |
| 206          | VHF Xmtr Power 1 On              | 244          | Left SAD Normal Rate             |
| 207          | VHF Xmtr Realtime Mode           | 245          | ECAM Zero Time                   |
| 210          | VHF Xmtr Low Power Mode          | 246          | Battery 1 Off                    |
| 211          | VHF Xmtr Power 2 Off             | 247          | Rate Measuring Package B Htr Off |
| 212          | MSS Band 2 High Voltage On       | 250          | VHF Select Xmtr B                |
| 213          | MSS Band 3 High Voltage On       | 251          | VHF Xmtr Playback Mode 1         |
| 214          | MSS Sel Shutter Monitor Source A | 252          | Spare (MSS)                      |
| 215          | Spare (MSS)                      | 253          | Spare (MSS)                      |
| 216          | Spare (MSS)                      | 254          | Spare (MSS)                      |
| 217          | MSS Scanner Power Line 1         | 255          | MSS Select Scan Monitor Source A |
| 220          | ECAM Off                         | 256          | MSS Scan Mirror Inhibit          |
| 221          | Orbit Adjust Mode Disable        | 257          | MSS Mux Normal                   |

Table B-1. LANDSAT-2 Commands (Cont'd)

| <u>CMD #</u> | <u>Command Function</u>          | <u>CMD #</u> | <u>Command Function</u>       |
|--------------|----------------------------------|--------------|-------------------------------|
| 260          | TMP Select A/D Converter A       | 315          | MSS Mux Compression Mode      |
| 261          | TMP Select Memory Unit B         | 316          | MSS System ON/OFF Normal      |
| 262          | TMP Select Analog Mux A          | 317          | Spare (MSS)                   |
| 263          | TMP Select Memory Sequencer B    | 320          | Spare                         |
| 264          | Battery 5 Off                    | 321          | TMP Select Digital Mux B      |
| 265          | Battery 6 Off                    | 322          | Spare                         |
| 266          | Rate Measuring Package B Off     | 323          | TMP Select Formatter Logic B  |
| 267          | Battery 2 Off                    | 324          | ECAM Output Enable            |
| 270          | Right Sad Disable                | 325          | Left SAD High Rate            |
| 271          | RMP A Motor Start                | 326          | RMP A On                      |
| 272          | Spare (MSS)                      | 327          | Battery 8 Off                 |
| 273          | Spare (MSS)                      | 330          | RMP B Lower Motor Voltage     |
| 274          | MSS Select Scan Monitor Source B | 331          | Battery 4 Off                 |
| 275          | Spare (MSS)                      | 332          | Spare (MSS)                   |
| 276          | MSS Mux Inhibit                  | 333          | MSS Mux Linear Mode           |
| 277          | MSS Scan Mirror Normal           | 334          | Spare (MSS)                   |
| 300          | TMP Select Digital Mux A         | 335          | MSS Mid Scan Code Off         |
| 301          | TMP Select A/D Converter B       | 336          | MSS Scan Mirror Power Line 2  |
| 302          | TMP Select Formatter Logic A     | 337          | MSS System ON/OFF Override    |
| 303          | TMP Select Analog Mux B          | 340          | TMP Memory Write On           |
| 304          | Rate Measuring Package B Mtr On  | 341          | TMP Matrix Verify Override On |
| 305          | RMP B Heater & Electronics On    | 342          | TMP No Mod to VHF Override On |
| 306          | Battery 7 Off                    | 343          | TMP Program Control Bit 0 Off |
| 307          | Rate Measuring Package A Off     | 344          | Left SAD Disable              |
| 310          | Battery 3 Off                    | 345          | Spare 8 Set                   |
| 311          | Right Sad Enable                 | 346          | Trickle Charge Normal         |
| 312          | MSS Scan Mirror Power Line 1     | 347          | Enable USBX Off               |
| 313          | Spare (MSS)                      | 350          | DCS Receiver 2 On             |
| 314          | MSS Mid Scan Code On             | 351          | RBV Primary Control Enable    |

Table B-1. LANDSAT-2 Commands (Cont'd)

| <u>CMD #</u> | <u>Command Function</u>         | <u>CMD #</u> | <u>Command Function</u>                      |
|--------------|---------------------------------|--------------|--|
| 352          | RBV Cathode Reactivation On     | 407          | DCS Receiver 1 Off                           |
| 353          | All Batteries On                | 410          | Rate Measuring Package A Lower Motor Voltage |
| 354          | Shunt Load A Off                | 411          | RBV/CCC Power On                             |
| 355          | All Comp Loads Off              | 412          | RBV Aperture Corrector In                    |
| 356          | Aux Load 1 On                   | 413          | All Aux Loads Off (B)                        |
| 357          | Aux Load 2 On                   | 414          | Comp Load 3 On                               |
| 360          | Spare 8 Reset                   | 415          | Shunt Load C Off                             |
| 361          | TMP Memory Write Off            | 416          | Comp Load 4 On                               |
| 362          | TMP Program Control Bit 0 On    | 417          | Comp Load 5 On                               |
| 363          | TMP Program Control Bit 1 On    | 420          | TMP No Mod to Override Off                   |
| 364          | Disable USBX Off                | 421          | TMP No Mod to VHF Xmtr                       |
| 365          | Left SAD Enable                 | 422          | TMP Verify Memory Off                        |
| 366          | DCS Receiver 1 On               | 423          | Spare  |
| 367          | Trickle Charge Override         | 424          | RBV Primary Control Disable                  |
| 370          | Rate Measuring Package A Htr On | 425          | Right SAD Normal Rate                        |
| 371          | RBV Cathode Reactivation Off    | 426          | WBVTR 1 Record                               |
| 372          | RBV Enable Calibration          | 427          | RBV Single Cycle                             |
| 373          | Verify Tick                     | 430          | RBV Start Prepare                            |
| 374          | All Aux Loads Off (A)           | 431          | RBV Aperture Corrector Out                   |
| 375          | Shunt Load B Off                | 432          | RBV CCC Power Off                            |
| 376          | Comp Load 1 On                  | 433          | RBV Camera 1 On                              |
| 377          | Comp Load 2 On                  | 434          | Comp Load 6 On                               |
| 400          | TMP Data to VHF Xmtr            | 435          | Aux Load 3 On                                |
| 401          | TMP Program Control Bit 1 Off   | 436          | Aux Load 4 On                                |
| 402          | TMP Matrix Verify Override Off  | 437          | All Shunt Loads On                           |
| 403          | TMP Verify Memory On            | 440          | TMP Select Xmtr Buffer AMP A                 |
| 404          | Right SAD High Rate             | 441          | TMP Matrix Verify On                         |
| 405          | RBV Camera 3 On                 | 442          | TMP Power 2 Off                              |
| 406          | DCS Receiver 2 Off              |              |  |

Table B-1. LANDSAT-2 Commands (Cont'd)

| <u>CMD #</u> | <u>Command Function</u>          | <u>CMD #</u> | <u>Command Function</u>          |
|--------------|----------------------------------|--------------|----------------------------------|
| 443          | TMP Force Program 00 Off         | 500          | TMP Memory Write/Verify Ovrđ On  |
| 444          | WBVTR 1 Volt Protect Relay Reset | 501          | TMP Pre-Regulator Output B       |
| 445          | WBVTR 1 Record Current Adjust    | 502          | TMP Matrix Normal                |
| 446          | WBVTR 1 RBV Enable               | 503          | TMP Power 1 Off                  |
| 447          | WBVTR 1 Playback                 | 504          | WBVTR 1 Fast Forward             |
| 450          | RBV Exposure 1                   | 505          | WBVTR 1 MSS Standby              |
| 451          | RBV Exposure 2                   | 506          | WBVTR 1 Voltage Protect Disable  |
| 452          | RBV Exposure 5                   | 507          | WBVTR 1 Lap                      |
| 453          | RBV Exposure 3                   | 510          | RBV Camera 2 Off                 |
| 454          | RBV Exposure 4                   | 511          | RBV Camera 1 Off                 |
| 455          | Aux Load 5 On                    | 512          | RBV Camera 3 Off                 |
| 456          | Shunt Load D Off                 | 513          | WBVTR 2 Record                   |
| 457          | Verify Tock                      | 514          | RT 1 Data to MSS Filter A        |
| 460          | TMP Pre-Regulator A On           | 515          | RT Data to RBV Filter A          |
| 461          | TMP Select Xmtr Buffer AMP B     | 516          | RT 2 Data to MSS Filter B        |
| 462          | TMP Force Program 00 On          | 517          | WBVTR 1 Data to RBV Filter B     |
| 463          | TMP Pre-Regulator Output A       | 520          | TMP Power 2 On                   |
| 464          | WBVTR 1 RBV Standby              | 521          | TMP Memory Write/Verify Ovrđ Off |
| 465          | WBVTR 1 Fast Rewind              | 522          | TMP Power 1 On                   |
| 466          | WBFM Select VCO B1               | 523          | TMP Pre-Regulator B On           |
| 467          | WBVTR 1 Voltage Protect Enable   | 524          | WBFM Select VCO A1               |
| 470          | RBV Continuous Cycle             | 525          | WBFM Inverter A Power On         |
| 471          | RBV Camera 2 On                  | 526          | WBFM Enable Modulator A AFC      |
| 472          | RBV Start Calibrate              | 527          | WBFM Inverter B Power Off        |
| 473          | RBV Disable Calibrate            | 530          | WBFM Disable Modulator B AFC     |
| 474          | Aux Data to RBV Filter A         | 531          | WBVTR 2 Data to RBV Filter B     |
| 475          | RT 1 Data to MSS Filter B        | 532          | WBVTR 2 Record Current Adjust    |
| 476          | RT Data to RBV Filter B          | 533          | WBVTR 2 RBV Enable               |
| 477          | Enable RBV Filter B              | 534          | WBVTR 2 Playback                 |

Table B-1. LANDSAT-2 Commands (Cont'd)

| <u>CMD #</u> | <u>Command Function</u>             | <u>CMD #</u> | <u>Command Function</u>                 |
|--------------|-------------------------------------|--------------|---|
| 535          | RT 2 Data to MSS Filter A           | 572          | WBVTR 2 MSS Standby                     |
| 536          | WBVTR 1 Data to RBV Filter A        | 573          | WBVTR 2 Voltage Protect Disable         |
| 537          | WBVTR 1 Data to MSS Filter B        | 574          | WBVTR 2 Lap                             |
| 540          | WBPA 1 Power On                     | 575          | Aux Data to RBV Filter B                |
| 541          | WBPA 1 Select 10W Output            | 576          | Enable MSS Filter B                     |
| 542          | NBTR 2 Playback Mode                | 577          | WBVTR 2 Data to MSS Filter A            |
| 543          | NBTR 1 Record Mode                  | 600          | WBPA 1 Select 20W Output                |
| 544          | Enable RBV Filter A                 | 601          | NBTR 2 Record Mode                      |
| 545          | WBFM Disable Modulator A AFC        | 602          | 0.6° Yaw Position Bias Enable           |
| 546          | Select RBV Bias A                   | 603          | Orbit Adjust Timer Disable              |
| 547          | WBFM Select VCO A2                  | 604          | Select NBTR 2                           |
| 550          | WBFM Inverter B Power On            | 605          | PMP Modulator A On                      |
| 551          | WBVTR 2 RBV Standby                 | 606          | Select NBTR                             |
| 552          | WBVTR 2 Fast Rewind                 | 607          | WBVTR 1 On (Primary)                    |
| 553          | WBVTR 2 Voltage Protect Relay Reset | 610          | MSS Enable (Primary)                    |
| 554          | WBVTR 2 Voltage Protect Enable      | 611          | Spare                                   |
| 555          | Enable MSS Filter A                 | 612          | RBV No. 1 Thermoelectric Module Disable |
| 556          | WBVTR 1 Data to MSS Filter A        | 613          | ISM Disable Selected Scanner            |
| 557          | WBVTR 2 Data to RBV Filter A        | 614          | ISM Switched Telemetry Power On         |
| 560          | Orbit Adjust Timer Enable           | 615          | Orbit Adjust Thruster Heater On         |
| 561          | WBPA 1 Power Off                    | 616          | MSFN to CIU A/STADAN to CIU B           |
| 562          | NBTR 1 Power Off                    | 617          | Disable PSM Relay Buss                  |
| 563          | WBVTR Search Track Switched         | 620          | NBTR 2 Power Off                        |
| 564          | Select RBV Bias B                   | 621          | NBTR 1 Playback Mode                    |
| 565          | WBFM Select VCO B2                  | 622          | Payload Reg Module Fuse Tap On          |
| 566          | WBFM Inverter A Power Off           | 623          | 0.6° Yaw Position Bias Disable          |
| 567          | WBFM Enable Modulator B AFC         | 624          | Select WBVTR 1                          |
| 570          | WBVTR 2 Data to MSS Filter B        | 625          | Inhibit WBFM RBV/A MSS B Filters        |
| 571          | WBVTR 2 Fast Forward                | 626          | PMP Modulator A Off                     |

Table B-1. LANDSAT-2 Commands (Cont'd)

| <u>CMD #</u> | <u>Command Function</u>          | <u>CMD #</u> | <u>Command Function</u>             |
|--------------|----------------------------------|--------------|-------------------------------------|
| 627          | Orbit Adjust On 1                | 664          | PMP Select WBVTR                    |
| 630          | WBVTR 1 Control Normal           | 665          | PMP Modulator B Off                 |
| 631          | WBVTR Search Track Normal        | 666          | Inhibit WBFM RBV B/MSS A Filters    |
| 632          | MSS Enable (Both)                | 667          | RBV On (Primary)                    |
| 633          | Right SAD Unfused                | 670          | PSM Solenoid 1 On                   |
| 634          | CMD Clock Relays on 5A Fuse      | 671          | WBVTR 2 Control Normal              |
| 635          | ISM Separation Switch Bypass     | 672          | RBV No. 3 Thermoelectric Module Ena |
| 636          | ISM Enable Scan & Select A       | 673          | ISM Switched Telemetry Power Off    |
| 637          | ECAM Smart Disable               | 674          | Right SAD Fused                     |
| 640          | 2.0° Pitch Position Bias Enable  | 675          | Lock Single Scanner Mode            |
| 641          | PSM Inverter A Power to WBFM     | 676          | Enable USB Xmtrs (Redundant)        |
| 642          | 0.6° Pitch Position Bias Enable  | 677          | RBV Magnetic Compensator Enable     |
| 643          | WBVTR 1 Control Reversed         | 700          | MMCA Power On                       |
| 644          | PMP Modulator B On               | 701          | Enable Payload Timer Signal         |
| 645          | Select WBVTR 2                   | 702          | MMCA Pitch Coil Out                 |
| 646          | Select NBTR 1                    | 703          | Inhibit Data to RBV Filter A        |
| 647          | MSS Disable                      | 704          | MMCA Yaw Coil Out                   |
| 650          | WBVTR 2 On (Primary)             | 705          | Prime Data to WBPA 1/2              |
| 651          | WBVTR 1 Off                      | 706          | MMCA Capacitor Dump                 |
| 652          | Spare 1 (Non-Latch)              | 707          | RBV No. 2 Thermoelectric Module Dis |
| 653          | CMD Clock Relays on 1A Fuse      | 710          | RBV On (Redundant)                  |
| 654          | Left SAD Unfused                 | 711          | PSM Solenoid 2 On                   |
| 655          | Enable PSM Relay Bus             | 712          | WBVTR 2 Off                         |
| 656          | APU Power On                     | 713          | Left SAD Fused                      |
| 657          | Orbit Adjust Thruster Heater Off | 714          | Unlock Single Scanner Mode          |
| 660          | PSM Inverter B Power to WBFM     | 715          | MSFN to CIU B/STADAN to CIU A       |
| 661          | 2.0° Pitch Position Bias Disable | 716          | Attitude Sensor Power On            |
| 662          | MSS Enable (Redundant)           | 717          | Spare (Non-Latch)                   |
| 663          | 0.6° Pitch Position Bias Disable | 720          | Disable Payload Timer Signal        |



Table B-1. LANDSAT-2 Commands (Cont'd)

| <u>CMD #</u> | <u>Command Function</u>                               | <u>CMD #</u> | <u>Command Function</u>                             |
|--------------|---|--------------|---|
| 721          | MMCA Pitch Coil In                                    | 755          | Enable USB/WBPA Timer Signal                        |
| 722          | Inhibit Data to RBV Filter B                          | 756          | Comp Load 7 On                                      |
| 723          | MMCA Yaw Coil In                                      | 757          | Disable USB Xmtrs                                   |
| 724          | Summed Data to WBPA 1                                 | 760          | Inhibit Data to MSS Filter B                        |
| 725          | MMCA Capacitor Charge                                 | 761          | MMCA Roll Coil Out                                  |
| 726          | WBVTR 2 Control Reverse                               | 762          | MMCA Capacitor Low                                  |
| 727          | Payload Reg Module On                                 | 763          | MMCA Polarity Negative                              |
| 730          | RBV No. 2 Thermoelectric Module Ena                   | 764          | Orbit Adjust Off                                    |
| 731          | RBV Off   | 765          | MMCA Power Off                                      |
| 732          | PSM Solenoid 3 On                                     | 766          | Payloads Off  |
| 733          | Switch Payload Regulator                              | 767          | Payload Reg Module Fuse Tap Off                     |
| 734          | ISM Enable Scan & Select B                            | 770          | RBV No. 1 Thermoelectric Module Ena                 |
| 735          | <del>MSS Heater Off</del><br><b>ECAM SMART ENABLE</b> | 771          | Payload Reg Module Off 2                            |
| 736          | RBV Magnetic Compensator Lo Mode                      | 772          | Disable USB/WBPA Timer Signal                       |
| 737          | APU Power Off   | 773          | Comp Load 8 On                                      |
| 740          | MMCA Roll Coil In                                     | 774          | Attitude Sensor Power Off                           |
| 741          | Inhibit Data to MSS Filter A                          | 775          | Enable USB Xmtrs (Primary)                          |
| 742          | MMCA Polarity Positive                                | 776          | Enable WBPA (Primary)                               |
| 743          | Summed Data to WBPA 2                                 | 777          | Spare   |
| 744          | MMCA Capacitor High                                   | 780          | Switch Spacecraft PWM Regualtor                     |
| 745          | PSM Solenoids Off                                     | 781          | CIU Channel B Off                                   |
| 746          | Orbit Adjust On 2                                     | 782          | CIU Ch B On/Sw STDN/MSFN Cmd Link                   |
| 747          | RBV On Both   | 783          | CMD Clock Pwr Supply/Comdecs On/ECAM Output Disable |
| 750          | Payload Reg Module Off 1                              | 784          | Switch Spacecraft PWM Regulator                     |
| 751          | RBV No. 3 Thermoelectric Module Dis                   | 785          | CIU Channel A Off                                   |
| 752          | RBV Magnetic Compensator Disable                      | 786          | CIU Ch A On/Sw STDN/MSFN Cmd Link                   |
| 753          | RBV Magnet ic Compensat or Hi Mode                    | 787          | CMD Clock Pwr Supply/Comdecs On/ECAM Output Disable |
| 754          | Enable WBPA (Redundant)                               |              |   |

Table B-2. LANDSAT-2 Command Matrix

| MA  | 000  | 001   | 002   | 003  | 004  | 005                               | 006                                    | 007                                 | 010   | 011   | 012   | 013   | 014                                     | 015   | 016                                    | 017                                     |   |
|-----|--|---|---|--|--|-----------------------------------|--|-------------------------------------|---|---|---|---|---|---|--|---|---|
| MB  |  |   |   |  |  |                                   |  |                                     |   |   |   |   |   |   |  |   |   |
| 000 | CLOCK (000) SPARE                              | CLOCK (000) PRIMARY COMSTOR ON F FILL         | CLOCK (002) SPARE                             | CLOCK (003) PRIMARY COMSTOR VERIFY           | CLOCK (004) PRIMARY COMSTOR COPY                 | CLOCK (005) PRIMARY COMSTOR OFF   | CLOCK (006) PRIMARY COMSTOR ACTIVATE   | CLOCK (007) SERIAL DATA TRANSFER ON | CLOCK (010) COMMAND EXECUTION COUNTER RESET | CLOCK (011) SELECT PRIMARY MATRIX A DECODER   | CLOCK (012) SELECT PRIMARY MATRIX B DRIVERS   | CLOCK (013) SELECT PRIMARY MATRIX B DRIVERS   | CLOCK (014) SELECT PRIMARY OSCILLATOR   | CLOCK (015) SELECT PRIMARY FREQ GENERATOR   | CLOCK (016) SPARE                      | CLOCK (017) LOAD TIME CODE              |   |
| 020 | CLOCK (020) TURN NON-KEYED PS/COMDECS OFF      | CLOCK (021) REDUNDANT COMSTOR ON F FILL       | CLOCK (022) SPARE                             | CLOCK (023) REDUNDANT COMSTOR VERIFY         | CLOCK (024) REDUNDANT COMSTOR COPY               | CLOCK (025) REDUNDANT COMSTOR OFF | CLOCK (026) REDUNDANT COMSTOR ACTIVATE | CLOCK (027) SPARE                   | CLOCK (030) SPARE                           | CLOCK (031) SELECT REDUNDANT MATRIX A DECODER | CLOCK (032) SELECT REDUNDANT MATRIX B DRIVERS | CLOCK (033) SELECT REDUNDANT MATRIX B DRIVERS | CLOCK (034) SELECT REDUNDANT OSCILLATOR | CLOCK (035) SELECT REDUNDANT FREQ GENERATOR | CLOCK (036) SPARE                      | CLOCK (037) SPARE                       |   |
| 040 | ACS (040) PNEUMATICS ENABLE                    | ACS (040) 0.3 YAW POS BIAS ENABLE             | ACS (042) PNEUMATICS INTERLOCK BYPASS DISABLE | ACS (043) PNEUMATICS INTERLOCK BYPASS ENABLE | ACS (044) PNEUMATICS LOW VOLTAGE INTERLOCK RESET | ACS (045) DIFF TACH DISABLE       | ECAM (046) ECAM EYECUTE                | WBPA (047) SELECT 10 WATT OUTPUT    | APU (048) STANDBY MODE                      | ECAM (049) ECAM LOAD                          | MSS (052) SYSTEM ON                           | MSS (053) SELECT INV. A                       | MSS (054) SELECT BAND 1 HIGH VOLTAGE A  | MSS (055) SELECT BAND 2 HIGH VOLTAGE A      | MSS (056) SELECT BAND 3 HIGH VOLTAGE A | MSS (057) SELECT BAND 1 ON              |   |
| 060 | ACS (060) 0.3 YAW POS BIAS DISABLE             | ACS (069) PNEUMATICS DISABLE                  | ACS (063) PNEUMATICS INTERLOCK BYPASS ENABLE  | ACS (064) DIFF TACH ENABLE                   | ECAM (065) ECAM EYECUTE                          | WBPA (067) SELECT 20 WATT OUTPUT  | WBPA (067) SELECT 20 WATT OUTPUT       | WBPA (067) SELECT 20 WATT OUTPUT    | APU (068) STANDBY MODE                      | ECAM (069) ECAM LOAD                          | MSS (072) SYSTEM OFF                          | MSS (073) SELECT INV. B                       | MSS (074) SELECT BAND 2 HIGH VOLTAGE B  | MSS (075) SELECT BAND 3 HIGH VOLTAGE B      | MSS (076) SELECT BAND 4 ON             | MSS (077) BAND 1 OFF                    | MSS (078) SELECT BAND 3 HIGH VOLTAGE B  |
| 100 | ACS (100) DIFF TACH NORMAL GAIN                | ACS (101) 0.1 YAW POS BIAS ENABLE             | ACS (102) RLNA INTO YAW DISABLE               | ACS (103) 2.9 PITCH POS BIAS ENABLE          | ACS (104) PITCH MOMENTUM BIAS DISABLE            | ECAM (105) ECAM RUN A             | WBPA (106) SELECT 20 WATT OUTPUT       | WBPA (106) SELECT 20 WATT OUTPUT    | WBPA (106) SELECT 20 WATT OUTPUT            | WBPA (106) SELECT 20 WATT OUTPUT              | MSS (102) HIGH VOLTAGE ON                     | MSS (103) BAND 2 ON                           | MSS (104) BAND 3 ON                     | MSS (105) BAND 4 ON                         | MSS (106) BAND 5 ON                    | MSS (107) SELECT CALIBRATION LAMP A     |   |
| 120 | ACS (120) 0.1 YAW POS BIAS DISABLE             | ACS (121) DIFF TACH HIGH GAIN                 | ACS (122) 2.9 PITCH BIAS DISABLE              | ACS (123) RLNA INTO YAW ENABLE               | ACS (124) PITCH MOMENTUM BIAS ENABLE             | ECAM (125) ECAM RUN A             | WBPA (126) SELECT XMTA                 | WBPA (126) SELECT XMTA              | WBPA (126) SELECT XMTA                      | WBPA (126) SELECT XMTA                        | MSS (132) BAND 2 OFF                          | MSS (133) BAND 2 OFF                          | MSS (134) BAND 4 OFF                    | MSS (135) BAND 3 OFF                        | MSS (136) BAND 3 OFF                   | MSS (137) SELECT CALIBRATION LAMP B     |   |
| 14Q | ACS (140) ROLL UNLOAD DISABLE                  | ACS (141) NEGATIVE YAW POS BIAS               | ACS (142) YAW WHEEL DISABLE                   | ACS (143) PITCH POS BIAS DISABLE             | ACS (144) PITCH POS BIAS DISABLE                 | ECAM (145) ECAM RUN B             | WBPA (146) SELECT XMTA                 | WBPA (146) SELECT XMTA              | WBPA (146) SELECT XMTA                      | WBPA (146) SELECT XMTA                        | MSS (152) ROTATING SHUTTER DRIVER ON          | MSS (153) BAND 1 HIGH GAIN                    | MSS (154) BAND 1 HIGH GAIN              | MSS (155) BAND 2 HIGH GAIN                  | MSS (156) BAND 2 HIGH GAIN             | MSS (157) CALIBRATION LAMP ON           | MSS (158) BAND 1 HIGH VOLTAGE ON        |
| 160 | ACS (160) POSITIVE YAW POS BIAS                | ACS (161) ROLL UNLOAD ENABLE                  | ACS (162) PNEUMATICS MOMENTARY ENABLE         | ACS (163) YAW WHEEL ENABLE                   | ACS (164) PITCH UNLOAD ENABLE                    | ECAM (165) ECAM RUN B             | WBPA (166) SELECT XMTA                 | WBPA (166) SELECT XMTA              | WBPA (166) SELECT XMTA                      | WBPA (166) SELECT XMTA                        | MSS (172) ROTATING SHUTTER DRIVER ON          | MSS (173) BAND 2 LOW GAIN                     | MSS (174) BAND 2 LOW GAIN               | MSS (175) BAND 1 LOW GAIN                   | MSS (176) BAND 1 LOW GAIN              | MSS (177) CALIBRATION LAMP OFF          | MSS (178) BAND 1 HIGH VOLTAGE OFF       |
| 200 | ACS (200) ORBIT ADJUST MODE ENABLE             | ECAM (201) ECAM ON                            | ACS (202) RMP A ENABLE                        | ACS (203) 400 RPM INTERLOCK ENABLE           | ACS (204) YAW ACQUISITION MODE                   | WBPA (205) SELECT XMTA            | WBPA (205) SELECT XMTA                 | WBPA (205) SELECT XMTA              | WBPA (205) SELECT XMTA                      | WBPA (205) SELECT XMTA                        | MSS (212) BAND 2 HIGH VOLTAGE ON              | MSS (213) BAND 3 HIGH VOLTAGE ON              | MSS (214) BAND 3 HIGH VOLTAGE ON        | MSS (215) BAND 2 HIGH VOLTAGE ON            | MSS (216) BAND 2 HIGH VOLTAGE ON       | MSS (217) DOOR OPEN DIRECTION           | MSS (218) DOOR OVER RIDE ACTIVATE       |
| 220 | ECAM (220) ECAM OFF                            | ACS (221) ORBIT ADJUST MODE DISABLE           | ACS (222) 400 RPM INTERLOCK DISABLE           | ACS (223) RMP B ENABLE                       | ACS (224) YAW NORMAL MODE                        | WBPA (225) SELECT XMTA            | WBPA (225) SELECT XMTA                 | WBPA (225) SELECT XMTA              | WBPA (225) SELECT XMTA                      | WBPA (225) SELECT XMTA                        | MSS (232) BAND 2 HIGH VOLTAGE OFF             | MSS (233) BAND 3 HIGH VOLTAGE OFF             | MSS (234) BAND 3 HIGH VOLTAGE OFF       | MSS (235) BAND 2 HIGH VOLTAGE OFF           | MSS (236) BAND 2 HIGH VOLTAGE OFF      | MSS (237) DOOR SHUTTER MONITOR SOURCE A | MSS (238) DOOR SHUTTER MONITOR SOURCE B |
| 240 | TMP (240) SELECT MEMORY UNIT A                 | TMP (241) SELECT MEMORY UNIT B                | TMP (242) SELECT MEMORY SEQUENCER UNIT A      | TMP (243) SELECT MEMORY SEQUENCER UNIT B     | ACS (244) LEFT SAD NORMAL RATE                   | ECAM (245) ECAM ZERO TIME         | ACS (246) RMP B HEATER OFF             | ACS (247) RMP B HEATER OFF          | ACS (248) RMP A HEATER OFF                  | ACS (249) RMP A HEATER OFF                    | MSS (252) BAND 5A GAIN STPB                   | MSS (253) BAND 5A GAIN STPB                   | MSS (254) BAND 5A GAIN STPB             | MSS (255) BAND 5A GAIN STPB                 | MSS (256) BAND 5A GAIN STPB            | MSS (257) MUX INHIBIT                   | MSS (258) MUX INHIBIT                   |
| 260 | TMP (260) SELECT A/D CONVERTER A               | TMP (261) SELECT MEMORY UNIT B                | TMP (262) SELECT MEMORY SEQUENCER UNIT A      | TMP (263) SELECT MEMORY SEQUENCER UNIT B     | ACS (264) RMP B HEATER OFF                       | ACS (265) RMP B HEATER OFF        | ACS (266) RMP B HEATER OFF             | ACS (267) RMP B HEATER OFF          | ACS (268) RMP B HEATER OFF                  | ACS (269) RMP B HEATER OFF                    | MSS (272) BAND 5B GAIN STPB                   | MSS (273) BAND 5B GAIN STPB                   | MSS (274) BAND 5B GAIN STPB             | MSS (275) BAND 5B GAIN STPB                 | MSS (276) BAND 5B GAIN STPB            | MSS (277) MUX INHIBIT                   | MSS (278) MUX INHIBIT                   |
| 300 | TMP (300) SELECT DIGITAL MUX A                 | TMP (301) SELECT A/D CONVERTER B              | TMP (302) SELECT MEMORY SEQUENCER UNIT A      | TMP (303) SELECT MEMORY SEQUENCER UNIT B     | ACS (304) RMP B HEATER ON                        | ACS (305) RMP B HEATER ON         | ACS (306) RMP B HEATER ON              | ACS (307) RMP B HEATER ON           | ACS (308) RMP B HEATER ON                   | ACS (309) RMP B HEATER ON                     | MSS (312) BAND 5B GAIN STPB                   | MSS (313) BAND 5B GAIN STPB                   | MSS (314) BAND 5B GAIN STPB             | MSS (315) BAND 5B GAIN STPB                 | MSS (316) BAND 5B GAIN STPB            | MSS (317) MUX INHIBIT                   | MSS (318) MUX INHIBIT                   |
| 320 | TMP (320) SELECT DIGITAL MUX B                 | TMP (321) SELECT MEMORY SEQUENCER UNIT A      | TMP (322) SELECT MEMORY SEQUENCER UNIT B      | TMP (323) SELECT MEMORY SEQUENCER UNIT A     | TMP (324) SELECT MEMORY SEQUENCER UNIT B         | ACS (325) LEFT SAD HIGH RATE      | ACS (326) RMP A ON                     | ACS (327) RMP A ON                  | ACS (328) RMP A ON                          | ACS (329) RMP A ON                            | MSS (332) BAND 5B GAIN STPB                   | MSS (333) BAND 5B GAIN STPB                   | MSS (334) BAND 5B GAIN STPB             | MSS (335) BAND 5B GAIN STPB                 | MSS (336) BAND 5B GAIN STPB            | MSS (337) MUX INHIBIT                   | MSS (338) MUX INHIBIT                   |
| 340 | TMP (340) MEMORY WRITE ON                      | TMP (341) MATRIX VERIFY OVERRIDE ON           | TMP (342) PROGRAM CONTROL BIT 2 OFF           | TMP (343) PROGRAM CONTROL BIT 2 OFF          | ACS (344) LEFT SAD DISABLE                       | ECAM (345) ECAM OUTPUT ENABLE     | ACS (346) RMP A ON                     | ACS (347) RMP A ON                  | ACS (348) RMP A ON                          | ACS (349) RMP A ON                            | MSS (352) BAND 5B GAIN STPB                   | MSS (353) BAND 5B GAIN STPB                   | MSS (354) BAND 5B GAIN STPB             | MSS (355) BAND 5B GAIN STPB                 | MSS (356) BAND 5B GAIN STPB            | MSS (357) MUX INHIBIT                   | MSS (358) MUX INHIBIT                   |
| 360 | PSM (360) SPARE B RESET                        | TMP (361) MEMORY WRITE OFF                    | TMP (362) PROGRAM CONTROL BIT 2 ON            | TMP (363) PROGRAM CONTROL BIT 2 ON           | ACS (364) LEFT SAD ENABLE                        | ECAM (365) ECAM OUTPUT ENABLE     | ACS (366) RMP A ON                     | ACS (367) RMP A ON                  | ACS (368) RMP A ON                          | ACS (369) RMP A ON                            | MSS (372) BAND 5B GAIN STPB                   | MSS (373) BAND 5B GAIN STPB                   | MSS (374) BAND 5B GAIN STPB             | MSS (375) BAND 5B GAIN STPB                 | MSS (376) BAND 5B GAIN STPB            | MSS (377) MUX INHIBIT                   | MSS (378) MUX INHIBIT                   |
| 400 | TMP (400) DATA TO VHF XMTA                     | TMP (401) PROGRAM CONTROL BIT 2 OFF           | TMP (402) MATRIX VERIFY OVERRIDE OFF          | TMP (403) MATRIX VERIFY OVERRIDE ON          | ACS (404) RIGHT SAD HIGH RATE                    | ACS (405) RMP A ON                | ACS (406) RMP A ON                     | ACS (407) RMP A ON                  | ACS (408) RMP A ON                          | ACS (409) RMP A ON                            | MSS (412) BAND 5B GAIN STPB                   | MSS (413) BAND 5B GAIN STPB                   | MSS (414) BAND 5B GAIN STPB             | MSS (415) BAND 5B GAIN STPB                 | MSS (416) BAND 5B GAIN STPB            | MSS (417) MUX INHIBIT                   | MSS (418) MUX INHIBIT                   |
| 420 | TMP (420) NO VHF XMTA TO VHF XMTA OVERRIDE OFF | TMP (421) NO VHF XMTA TO VHF XMTA OVERRIDE ON | TMP (422) MATRIX VERIFY MEMORY OFF            | TMP (423) MATRIX VERIFY MEMORY ON            | ACS (424) RIGHT SAD NORMAL RATE                  | ACS (425) RMP A ON                | ACS (426) RMP A ON                     | ACS (427) RMP A ON                  | ACS (428) RMP A ON                          | ACS (429) RMP A ON                            | MSS (432) BAND 5B GAIN STPB                   | MSS (433) BAND 5B GAIN STPB                   | MSS (434) BAND 5B GAIN STPB             | MSS (435) BAND 5B GAIN STPB                 | MSS (436) BAND 5B GAIN STPB            | MSS (437) MUX INHIBIT                   | MSS (438) MUX INHIBIT                   |
| 440 | TMP (440) SELECT XMTA BUFFER AMP A             | TMP (441) MATRIX VERIFY ON                    | TMP (442) MATRIX VERIFY OFF                   | TMP (443) FORCE PROGRAM O,0 OFF              | ACS (444) RMP A ON                               | ACS (445) RMP A ON                | ACS (446) RMP A ON                     | ACS (447) RMP A ON                  | ACS (448) RMP A ON                          | ACS (449) RMP A ON                            | MSS (452) BAND 5B GAIN STPB                   | MSS (453) BAND 5B GAIN STPB                   | MSS (454) BAND 5B GAIN STPB             | MSS (455) BAND 5B GAIN STPB                 | MSS (456) BAND 5B GAIN STPB            | MSS (457) MUX INHIBIT                   | MSS (458) MUX INHIBIT                   |
| 460 | TMP (460) PRE-REG A ON                         | TMP (461) SELECT XMTA BUFFER AMP B            | TMP (462) FORCE PROGRAM O,0 ON                | TMP (463) PRE-REG OUTPUT A                   | ACS (464) RMP A ON                               | ACS (465) RMP A ON                | ACS (466) RMP A ON                     | ACS (467) RMP A ON                  | ACS (468) RMP A ON                          | ACS (469) RMP A ON                            | MSS (472) BAND 5B GAIN STPB                   | MSS (473) BAND 5B GAIN STPB                   | MSS (474) BAND 5B GAIN STPB             | MSS (475) BAND 5B GAIN STPB                 | MSS (476) BAND 5B GAIN STPB            | MSS (477) MUX INHIBIT                   | MSS (478) MUX INHIBIT                   |
| 500 | TMP (500) MEMORY WRITE/VERIFY OVERRIDE ON      | TMP (501) PRE-REG OUTPUT B                    | TMP (502) MATRIX NORMAL                       | TMP (503) POWER NO. 1 OFF                    | ACS (504) RMP A ON                               | ACS (505) RMP A ON                | ACS (506) RMP A ON                     | ACS (507) RMP A ON                  | ACS (508) RMP A ON                          | ACS (509) RMP A ON                            | MSS (512) BAND 5B GAIN STPB                   | MSS (513) BAND 5B GAIN STPB                   | MSS (514) BAND 5B GAIN STPB             | MSS (515) BAND 5B GAIN STPB                 | MSS (516) BAND 5B GAIN STPB            | MSS (517) MUX INHIBIT                   | MSS (518) MUX INHIBIT                   |
| 520 | TMP (520) POWER NO. 2 ON                       | TMP (521) MEMORY WRITE/VERIFY OVERRIDE OFF    | TMP (522) MATRIX NORMAL                       | TMP (523) PRE-REG NO. 1 ON                   | ACS (524) RMP A ON                               | ACS (525) RMP A ON                | ACS (526) RMP A ON                     | ACS (527) RMP A ON                  | ACS (528) RMP A ON                          | ACS (529) RMP A ON                            | MSS (532) BAND 5B GAIN STPB                   | MSS (533) BAND 5B GAIN STPB                   | MSS (534) BAND 5B GAIN STPB             | MSS (535) BAND 5B GAIN STPB                 | MSS (536) BAND 5B GAIN STPB            | MSS (537) MUX INHIBIT                   | MSS (538) MUX INHIBIT                   |
| 540 | WBPA (540) POWER ON                            | WBPA (541) SELECT 10 WATT OUTPUT              | WBPA (542) PLAYBACK MODE                      | WBPA (543) RECORD MODE                       | ACS (544) RMP A ON                               | ACS (545) RMP A ON                | ACS (546) RMP A ON                     | ACS (547) RMP A ON                  | ACS (548) RMP A ON                          | ACS (549) RMP A ON                            | MSS (552) BAND 5B GAIN STPB                   | MSS (553) BAND 5B GAIN STPB                   | MSS (554) BAND 5B GAIN STPB             | MSS (555) BAND 5B GAIN STPB                 | MSS (556) BAND 5B GAIN STPB            | MSS (557) MUX INHIBIT                   | MSS (558) MUX INHIBIT                   |
| 560 | PSM (560) ORBIT ADJUST TIMER ENABLE            | WBPA (561) POWER OFF                          | WBPA (562) PLAYBACK MODE                      | WBPA (563) RECORD MODE                       | ACS (564) RMP A ON                               | ACS (565) RMP A ON                | ACS (566) RMP A ON                     | ACS (567) RMP A ON                  | ACS (568) RMP A ON                          | ACS (569) RMP A ON                            | MSS (572) BAND 5B GAIN STPB                   | MSS (573) BAND 5B GAIN STPB                   | MSS (574) BAND 5B GAIN STPB             | MSS (575) BAND 5B GAIN STPB                 | MSS (576) BAND 5B GAIN STPB            | MSS (577) MUX INHIBIT                   | MSS (578) MUX INHIBIT                   |
| 600 | WBPA (600) SELECT 20 WATT OUTPUT               | WBPA (601) RECORD MODE                        | ACS (602) 0.6 YAW POS BIAS ENABLE             | PSM (603) ORBIT ADJUST TIMER DISABLE         | PMP (604) SELECT NBTR 2                          | PMP (605) SELECT NBTR 1           | PMP (606) SELECT NBTR 1                | PMP (607) SELECT NBTR 1             | PMP (608) SELECT NBTR 1                     | PMP (609) SELECT NBTR 1                       | MSS (612) BAND 5B GAIN STPB                   | MSS (613) BAND 5B GAIN STPB                   | MSS (614) BAND 5B GAIN STPB             | MSS (615) BAND 5B GAIN STPB                 | MSS (616) BAND 5B GAIN STPB            | MSS (617) MUX INHIBIT                   | MSS (618) MUX INHIBIT                   |
| 620 | WBPA (620) POWER OFF                           | WBPA (621) PLAYBACK MODE                      | ACS (622) 0.6 YAW POS BIAS DISABLE            | PSM (623) ORBIT ADJUST TIMER DISABLE         | PMP (624) SELECT NBTR 1                          | PMP (625) SELECT NBTR 2           | PMP (626) SELECT NBTR 2                | PMP (627) SELECT NBTR 2             | PMP (628) SELECT NBTR 2                     | PMP (629) SELECT NBTR 2                       | MSS (632) BAND 5B GAIN STPB                   | MSS (633) BAND 5B GAIN STPB                   | MSS (634) BAND 5B GAIN STPB             | MSS (635) BAND 5B GAIN STPB                 | MSS (636) BAND 5B GAIN STPB            | MSS (637) MUX INHIBIT                   | MSS (638) MUX INHIBIT                   |
| 640 | ACS (640) 2.0 PITCH POS BIAS ENABLE            | PSM (641) INVERTER A PWR TO WBFA              | ACS (642) 0.6 YAW POS BIAS ENABLE (RED)       | PSM (643) MSS ENABLE (RED)                   | PMP (644) SELECT NBTR 1                          | PMP (645) SELECT NBTR 2           | PMP (646) SELECT NBTR 2                | PMP (647) SELECT NBTR 2             | PMP (648) SELECT NBTR 2                     | PMP (649) SELECT NBTR 2                       | MSS (652) BAND 5B GAIN STPB                   | MSS (653) BAND 5B GAIN STPB                   | MSS (654) BAND 5B GAIN STPB             | MSS (655) BAND 5B GAIN STPB                 | MSS (656) BAND 5B GAIN STPB            | MSS (657) MUX INHIBIT                   | MSS (658) MUX INHIBIT                   |
| 660 | PSM (660) INVERTER A PWR TO WBFA               | ACS (661) 2.0 PITCH POS BIAS DISABLE          | PSM (662) MSS ENABLE (RED)                    | PSM (663) MSS ENABLE (RED)                   | PMP (664) SELECT NBTR 1                          | PMP (665) SELECT NBTR 2           | PMP (666) SELECT NBTR 2                | PMP (667) SELECT NBTR 2             | PMP (668) SELECT NBTR 2                     | PMP (669) SELECT NBTR 2                       | MSS (672) BAND 5B GAIN STPB                   | MSS (673) BAND 5B GAIN STPB                   | MSS (674) BAND 5B GAIN STPB             | MSS (675) BAND 5B GAIN STPB                 | MSS (676) BAND 5B GAIN STPB            | MSS (677) MUX INHIBIT                   | MSS (678) MUX INHIBIT                   |
| 700 | MMCA (700) POWER ON                            | PSM (701) INHIBIT PAYLOAD TIMER SIGNAL        | MMCA (702) PITCH COIL OUT                     | PSM (703) INHIBIT DATA TO RBV FILTER A       | MMCA (704) YAW COIL OUT                          | MMCA (705) PRIME DATA TO WBPA 1   | MMCA (706) CAP DUMP                    | MMCA (707) CAP DUMP                 | MMCA (708) CAP DUMP                         | MMCA (709) CAP DUMP                           | MSS (712) BAND 5B GAIN STPB                   | MSS (713) BAND 5B GAIN STPB                   | MSS (714) BAND 5B GAIN STPB             | MSS (715) BAND 5B GAIN STPB                 | MSS (716) BAND 5B GAIN STPB            | MSS (717) MUX INHIBIT                   | MSS (718) MUX INHIBIT                   |
| 720 | PSM (720) DISABLE PAYLOAD TIMER SIGNAL         | MMCA (721) INHIBIT COIL IN                    | MMCA (722) PITCH COIL IN                      | PSM (723) INHIBIT DATA TO RBV FILTER B       | MMCA (724) YAW COIL IN                           | MMCA (725) CAP CHARGE             | MMCA (726) CAP CHARGE                  | MMCA (727) CAP CHARGE               | MMCA (728) CAP CHARGE                       | MMCA (729) CAP CHARGE                         | MSS (732) BAND 5B GAIN STPB                   | MSS (733) BAND 5B GAIN STPB                   | MSS (734) BAND 5B GAIN STPB             | MSS (735) BAND 5B GAIN STPB                 | MSS (736) BAND 5B GAIN STPB            | MSS (737) MUX INHIBIT                   | MSS (738) MUX INHIBIT                   |
| 740 | MMCA (740) ROLL COIL IN                        | PSM (741) INHIBIT DATA TO MSS FILTER A        | MMCA (742) POLARITY POSITIVE                  | PSM (743) SUMMED DATA TO WBPA 2              | MMCA (744) CAP HIGH                              | MMCA (745) SOLENOIDS OFF          | MMCA (746) SOLENOIDS OFF               | MMCA (747) SOLENOIDS OFF            | MMCA (748) SOLENOIDS OFF                    | MMCA (749) SOLENOIDS OFF                      | MSS (752) BAND 5B GAIN STPB                   | MSS (753) BAND 5B GAIN STPB                   | MSS (754) BAND 5B GAIN STPB             | MSS (755) BAND 5B GAIN STPB                 | MSS (756) BAND 5B GAIN STPB            | MSS (757) MUX INHIBIT                   | MSS (758) MUX INHIBIT                   |
| 760 | PSM (760) INHIBIT DATA TO MSS FILTER B         | MMCA (761) ROLL COIL OUT                      | MMCA (762) CAP LOW                            | MMCA (763) POLARITY NEGATIVE                 | MMCA (764) ORBIT ADJUST OFF                      | MMCA (765) POWER OFF              | MMCA (766) POWER OFF                   | MMCA (767) POWER OFF                | MMCA (768) POWER OFF                        | MMCA (769) POWER OFF                          | MSS (772) BAND 5B GAIN STPB                   | MSS (773) BAND 5B GAIN STPB                   | MSS (774) BAND 5B GAIN STPB             | MSS (775) BAND 5B GAIN STPB                 | MSS (776) BAND 5B GAIN STPB            | MSS (777) MUX INHIBIT                   | MSS (778) MUX INHIBIT                   |

| COMMAND DESIGNATION | CIU COMMAND                      |
|---------------------|----------------------------------|
| CA00 (100)          | SWITCH S/C REGULATOR             |
| CA01 (120)          | CIU CHANNELS OFF                 |
| CA02 (140)          | CIU CHANNEL B ON                 |
| CA03 (160)          | SWITCH STADAN/MSFN COMMAND LINKS |
| CA04 (180)          | COMMAND CLOCK PS/COMDECS ON      |
| CA05 (200)          | ECAM OUTPUT DISABLE              |
| CB00 (220)          | SWITCH S/C REGULATOR             |
| CB01 (240)          | CIU CHANNEL A ON                 |
| CB02 (260)          | SWITCH STADAN/MSFN COMMAND LINKS |
| CB03 (280)          | COMMAND CLOCK PS/COMDECS ON      |
| CB04 (300)          | ECAM OUTPUT DISABLE              |

FOLDOUT FRAME

FOLDOUT FRAME

FOLDOUT FRAME

APPENDIX C  
TELEMETRY MATRIX

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\* 1000 - ATTITUDE CONTROL SUBSYSTEM \*  
\* \*  
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| C-2                              | FUNC NO. | TLH FUNCTION                      | ACRONYM  | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CCNN | INT CCNN         |
|----------------------------------|----------|-----------------------------------|----------|------------|----------|-----------|-------------|----------|----------|------------------|
| FORWARD SCANNER SIGNAL PROCESSOR |          |                                   |          |            |          |           |             |          |          |                  |
|                                  | 1001     | FWD SCAN LEAD EARTH PULSE         | FSC L EP | ALOG       | 1/16     | A106      | 15 09       | 4T80-81  | 7112-7   | 6T00-73          |
|                                  | 1002     | FWD SCAN TRAIL EARTH PULSE        | FSC T EP | ALOG       | 1/16     | A170      | 18 18       | 4T82-81  | 7112-6   | 6T00-72          |
|                                  | 1003     | FWD SCAN PRESSURE                 | FSC PRES | ALOG       | 1/16     | A233      | 18 27       | 4T84-01  | 7112-4   | 6T00-70          |
|                                  | 1004     | FWD SCAN PREAMP CARD TEMP         | FSC PA T | ALOG       | 1/16     | A298      | 02 37       | 4T86-81  | 7112-10  | 6T00-76          |
|                                  | 1005     | FWD SCAN REF PROCESSOR CARD TEMP  | FSC RP T | ALOG       | 1/16     | A526      | 15 69       | 4T94-4H  | 7112-8   | 6T00-74          |
|                                  | 1006     | FWD SCAN UPSIDE DOWN              | FSC UPDN | ALOG       | 1/16     | A490      | 12 64       | 4T92-81  | 7112-11  | 6T00-77          |
|                                  | 1007     | FWD SCAN MOTOR TEMP               | FSC TEMP | ALOG       | 1/16     | A554      | 15 73       | 4T94-81  | 7112-5   | 6T00-71          |
| REAR SCANNER SIGNAL PROCESSOR    |          |                                   |          |            |          |           |             |          |          |                  |
|                                  | 1010     | REAR SCAN LEAD EARTH PULSE        | RSC L EP | ALOG       | 1/16     | A105      | 12 09       | 4T80-01  | 7122-6   | 6T01-42          |
|                                  | 1011     | REAR SCAN TRAIL EARTH PULSE       | RSC T EP | ALOG       | 1/16     | A169      | 15 18       | 4T82-01  | 7122-7   | 6T01-43          |
|                                  | 1012     | REAR SCAN PRESSURE                | RSC PRES | ALOG       | 1/16     | A232      | 15 27       | 4T84-17  | 7122-4   | 6T01-40          |
|                                  | 1013     | REAR SCAN PREAMP CARD TEMP        | RSC PA T | ALOG       | 1/16     | A297      | 01 37       | 4T86-01  | 7122-10  | 6T01-46          |
|                                  | 1014     | REAR SCAN REF PROCESSOR CARD TEMP | RSC RP T | ALOG       | 1/16     | A424      | 02 55       | 4T90-17  | 7122-8   | 6T01-44          |
|                                  | 1015     | REAR SCAN UPSIDE DOWN             | RSC UPDN | ALOG       | 1/16     | A489      | 10 64       | 4T92-01  | 7122-11  | 6T01-47          |
|                                  | 1016     | REAR SCAN MOTOR TEMP              | RSC TEMP | ALOG       | 1/16     | A553      | 12 73       | 4T94-01  | 7122-5   | 6T01-41          |
| CONTROL LOGIC BOX                |          |                                   |          |            |          |           |             |          |          |                  |
|                                  | 1020     | ROLL LEAD AMP OUTPUT              | R LD AMP | ALOG       | 1/1      | A627      | 11 01       | 4T96-80  | 7001-24  | 6T00-21 FM 10-11 |
|                                  | 1021     | ROLL DIFF TACH AMP OUTPUT         | R DF TCH | ALOG       | 1/1      | A628      | 13 01       | 4T96-27  | 7001-7   | 6T00-6 FM 10-11  |
|                                  | 1022     | ROLL REAR MOTOR DRIVER (CCW)      | RRMD CCW | ALOG       | 1/16     | A104      | 10 09       | 4T80-17  | 7001-6   | 6T00-5           |
|                                  | 1023     | ROLL FWD MOTOR DRIVER (CCW)       | RFMD CCW | ALOG       | 1/16     | A168      | 12 18       | 4T82-17  | 7001-8   | 6T00-7           |
|                                  | 1024     | ROLL FWD MOTOR DRIVER (CW)        | RFMD CW  | ALOG       | 1/16     | A235      | 02 28       | 4T84-30  | 7001-41  | 6T00-26          |
|                                  | 1025     | ROLL REAR MOTOR DRIVER (CW)       | RRMD CW  | ALOG       | 1/16     | A422      | 18 54       | 4T90-54  | 7001-39  | 6T00-34          |
|                                  | 1026     | ROLL FWD FLYWHEEL SPEED           | RFFW SPD | ALOG       | 1/1      | A603      | 06 00       | 4T96-69  | 7001-22  | 6T00-19          |
|                                  | 1027     | ROLL REAR FLYWHEEL SPEED          | RREW SPD | ALOG       | 1/1      | A604      | 07 00       | 4T96-30  | 7001-40  | 6T00-25          |
|                                  | 1028     | ROLL PNEUMATICS MODULATOR         | R PN MOD | ALOG       | 1/16     | A369      | 08 47       | 4T88-0H  | 7001-25  | 6T00-22          |
|                                  | 1029     | ROLL COARSE ERROR                 | R FR CRS | ALOG       | 1/1      | A605      | 04 01       | 4T96-29  | 7001-42  | 6T00-37          |
|                                  | 1030     | ROLL FINE ERROR                   | R FR FNE | ALOG       | 1/1      | A606      | 05 01       | 4T96-50  | 7001-1   | 6T00-1           |
|                                  | 1031     | ROLL DIFF TACH AMP STATUS         | R DFT ST | ALOG       | 1/16     | A488      | 08 64       | 4T92-17  | 7001-35  | 6T00-75          |
|                                  | 1032     | ROLL SOLENOID DUTY CYCLE          | R SOL DC | ALOG       | 1/16     | A552      | 10 73       | 4T94-17  | 7001-50  | 6T00-45          |
|                                  | 1033     | YAW MOTOR DRIVER (CW)             | Y MD CW  | ALOG       | 1/16     | A102      | 02 09       | 4T80-54  | 7001-28  | 6T00-25          |
|                                  | 1034     | YAW MOTOR DRIVER (CCW)            | Y MD CCW | ALOG       | 1/16     | A166      | 08 18       | 4T82-54  | 7001-11  | 6T00-10          |
|                                  | 1035     | YAW TACH AMP OUTPUT               | Y TACH   | ALOG       | 1/1      | A607      | 06 01       | 4T96-74  | 7001-12  | 6T00-11          |
|                                  | 1036     | YAW PNEUMATICS MODULATOR          | Y PN MOD | ALOG       | 1/16     | A234      | 01 23       | 4T84-81  | 7001-45  | 6T00-40          |
|                                  | 1037     | YAW SOLENOID DUTY CYCLE           | Y SOL DC | ALOG       | 1/16     | A296      | 18 36       | 4T86-17  | 7001-16  | 6T00-15          |
|                                  | 1038     | PITCH MOTOR DRIVER (CCW)          | P MD CCW | ALOG       | 1/16     | A362      | 08 46       | 4T88-81  | 7001-43  | 6T00-38          |
|                                  | 1039     | PITCH MOTOR DRIVER (CW)           | P MD CW  | ALOG       | 1/16     | A421      | 15 54       | 4T90-31  | 7001-47  | 6T00-42          |
|                                  | 1040     | PITCH COARSE ERROR                | P FR CRS | ALOG       | 1/1      | A608      | 07 01       | 4T96-16  | 7001-26  | 6T00-23          |
|                                  | 1041     | PITCH FINE ERROR                  | P FR FNE | ALOG       | 1/1      | A610      | 04 02       | 4T96-07  | 7001-34  | 6T00-31          |

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| FUNC NO. | FLM FUNCTION   | ACRONYM  | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CCM | INT CONN        |
|----------|--|----------|------------|----------|-----------|-------------|----------|---------|-----------------|
| 1042     | PITCH TACH   | P TACH   | ALOG       | 1/16     | A486      | 01 64       | 4T92-54  | 7001-17 | 6T00-16         |
| 1043     | PITCH FLYWHEEL SPEED   | P FW SPD | ALOG       | 1/1      | A611      | 05 02       | 4T96-82  | 7001-27 | 6T00-24         |
| 1044     | PITCH PNEUMATIC MODULATOR                                      | P PN MOD | ALOG       | 1/1      | A612      | 13 00       | 4T96-52  | 7001-10 | 6T00-9 FM 10-11 |
| 1045     | PITCH SOLENOID DUTY CYCLE                                      | P SOL DC | ALOG       | 1/16     | A550      | 02 73       | 4T94-54  | 7001-33 | 6T00-30         |
| 1046     | J.A./ACO MODE STATUS   | OA/AO ST | ALOG       | 1/16     | A095      | 02 08       | 4T80-74  | 7001-18 | 6T00-79         |
| 1047     | (0.6)(0.3)(0.4) DEG. YAW BIAS STATUS                           | YBIAS ST | ALOG       | 1/16     | A159      | 08 17       | 4T82-74  | 7001-3  | 6T00-9          |
| 1048     | (0.5)(1.6)(3.4) DEG PITCH POSIT BIAS STATUS                    | PBIAS ST | ALOG       | 1/16     | A230      | 10 27       | 4T84-54  | 7001-2  | 6T00-78         |
| 1049     | PLUS OR MINUS PITCH POSIT BIAS/ YAW POSIT BIAS/ RMP A/B STATUS | PYPMP ST | ALOG       | 1/16     | A287      | 12 35       | 4T86-74  | 7001-20 | 6T00-17         |
| 1050     | PITCH AND ROLL MOM. UNLOAD                                     | PR UNLD  | ALOG       | 1/16     | A361      | 02 46       | 4T88-01  | 7001-37 | 6T00-32         |
| 1051     | LOW VOLTAGE-PAEU INTERLOCK                                     | LV/P INT | ALOG       | 1/16     | A420      | 12 54       | 4T90-52  | 7001-46 | 6T00-41         |
| 1052     | PNEU INTERLOCK BYPASS AND YAW FINE CONTROL                     | YFN C EN | ALOG       | 1/16     | A485      | 18 63       | 4T92-31  | 7001-29 | 6T00-26         |
| 1053     | 3LB PHASE A CLOCK  | CLOCK A  | ALOG       | 1/16     | A548      | 18 72       | 4T94-52  | 7001-38 | 6T00-33         |
| 1054     | 3LB PHASE B CLOCK  | CLOCK B  | ALOG       | 1/16     | A094      | 01 08       | 4T80-50  | 7001-21 | 6T00-18         |
| 1055     | 3LB PLUS OR MINUS 10 VOLT SUPPLY                               | +/- 10V  | ALOG       | 1/16     | A158      | 02 17       | 4T82-50  | 7001-23 | 6T00-20         |
| 1056     | 3LB PLUS OR MINUS 6 VOLT SUPPLY                                | +/- 6V   | ALOG       | 1/16     | A229      | 08 27       | 4T84-31  | 7001-9  | 6T00-8          |
| 1057     | 3LB POWER SUPPLY VOLTAGE                                       | P/S VOLT | ALOG       | 1/16     | A360      | 01 46       | 4T88-17  | 7001-30 | 6T00-27         |
| 1058     | 3LB MOTOR DRIVER CARD TEMP.                                    | MTR DR T | ALOG       | 1/16     | A484      | 15 63       | 4T92-52  | 7001-4  | 6T00-3          |
| 1059     | 3LB POWER SUPPLY CARD TEMP.                                    | PS CRD T | ALOG       | 1/16     | A549      | 01 73       | 4T94-31  | 7001-13 | 6T00-12         |
| 1060     | RLNA INTO YAW OUT/IN   | RLNA-YAW | DIG B      | 1/16     | 2B48      | 10 01       | 4T02-34  | 7001-36 | 6T00-31         |
| 1061     | 400 RPM INTERIK DIS/EN   | 400 RPM  | DIG B      | 1/16     | 2B49      | 12 01       | 4T02-10  | 7001-44 | 6T00-39         |
| 1062     | ROLL ( ) SOLENOID ON/OFF                                       | R - SOL  | DIG B      | 1/1      | 5B33      | 16 02       | 4T02-31  | 7001-15 | 6T00-14         |
| 1063     | ROLL - SOLENOID ON/OFF   | R - SOL  | DIG B      | 1/1      | 5B34      | 17 02       | 4T04-74  | 7001-48 | 6T00-43         |
| 1064     | PITCH ( ) SOLENOID ON/OFF                                      | P SOL    | DIG B      | 1/1      | 5B35      | 16 03       | 4T04-28  | 7001-49 | 6T00-44         |
| 1065     | PITCH (-) SOLENOID ON/OFF                                      | P - SOL  | DIG B      | 1/1      | 5B36      | 17 03       | 4T06-74  | 7001-32 | 6T00-29         |
| 1066     | YAW ( ) SOLENOID ON/OFF  | Y SOL    | DIG B      | 1/1      | 7B33      | 16 02       | 4T02-70  | 7001-31 | 6T00-28         |
| 1067     | YAW (-) SOLENOID ON/OFF  | Y - SOL  | DIG B      | 1/1      | 3B37      | 16 04       | 4T06-66  | 7001-14 | 6T00-13         |

YAW RATE GYRO (YRG)

|      |                         |          |       |      |      |       |         |        |                 |
|------|-------------------------|----------|-------|------|------|-------|---------|--------|-----------------|
| 1070 | YRG HOUSING TEMPERATURE | YRG HS T | ALOG  | 1/16 | A093 | 18 07 | 4T80-29 | 7302-3 | 6T01-13         |
| 1071 | YRG WHEEL SPEED         | YRG+0PD+ | ATOG+ | 1/16 | AA57 | 01 17 | 4T82-29 | 7302-5 | 6T01-14         |
| 1072 | YRG INDICATED RATE      | YRG RATE | ALOG  | 1/1  | A613 | 13 04 | 4T96-31 | 7302-1 | 6T01-12 FM 10-1 |

RATE MEASURING PACKAGE NO 1

|      |   |                |      |      |      |       |         |         |         |
|------|---|----------------|------|------|------|-------|---------|---------|---------|
| 1080 | RMP SUPPLY VOLTAGE NO 1                     | RP1 PS V       | ALOG | 1/16 | A220 | 01 26 | 4T84-30 | 7502-3  | 6T01-60 |
| 1081 | RMP MOTOR VOLTAGE NO 1                      | RR1 -0 V A -++ | 1/1  | 1+8  | 10   |       | 4T86-50 | 7502-4  | 6T01-61 |
| 1082 | RMP MOTOR CURRENT NO 1                      | RP1 MT I       | ALOG | 1/16 | A351 | 15 44 | 4T88-74 | 7502-5  | 6T01-62 |
| 1083 | RMP A HEATER POWER                          | RMP HTRP       | ALOG | 1/16 | A415 | 18 53 | 4T90-74 | 7502-7  | 6T01-64 |
| 1084 | RMP GYRO TEMPERATURE NO 1                   | RP1 GY T       | ALOG | 1/16 | A479 | 01 63 | 4T92-74 | 7502-9  | 6T01-65 |
| 1085 | RMP PACKAGE TEMP NO 1                       | RP1 PK T       | ALOG | 1/16 | A543 | 02 72 | 4T94-74 | 7502-10 | 6T01-66 |
| 1086 | RMP INDICATED RATE (MEDIUM RESOLUTION) NO 1 | RP1 IR M       | ALOG | 1/1  | A614 | 06 02 | 4T96-54 | 7502-12 | 6T01-68 |

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| FUNC NO. | TLM FUNCTION                              | ACRONYM  | SIGNL TYPE | SAMP SEC. | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CCNN | INT CCNN |
|----------|---|----------|------------|-----------|-----------|-------------|----------|----------|----------|
| 1087     | RMP INDICATED RATE (HIGH RESOLUTION) NO 1 | RP1 IR H | ALOG       | 1/1       | A609      | 09 01       | 4T96-03  | 7502-11  | 6T01-67  |
| 1088     | RMP RELAY GROUP A STATUS NO 1             | RP1 ASTA | ALOG       | 1/16      | A092      | 15 07       | 4T80-30  | 7502-1   | 6T01-58  |
| 1089     | RMP RELAY GROUP B STATUS NO 1             | RP1 BSTA | ALOG       | 1/16      | A156      | 18 16       | 4T82-30  | 7502-2   | 6T01-59  |

| FUNC NO.                  | TLN FUNCTION                                | ACRONYM  | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CCA# | INT CCNN |
|---------------------------|---|----------|------------|----------|-----------|-------------|----------|----------|----------|
| 1090                      | RMP SUPPLY VOLTAGE NO 2                     | RP2 PS V | ALOG       | 1/16     | A219      | 18 25       | 4T84-69  | 7602-3   | 6T01-54  |
| 1091                      | RMP MOTOR VOLTAGE NO 2                      | RP2 MT V | ALOG       | 1/16     | A285      | 08 35       | 4T86-29  | 7602-4   | 6T01-63  |
| 1092                      | RMP MOTOR CURRENT NO 2                      | RP2 MT I | ALOG       | 1/16     | A350      | 12 44       | 4T88-50  | 7602-5   | 6T01-69  |
| 1093                      | RMP HEATER POWER NO 2                       | RP2 HTRP | ALOG       | 1/16     | A414      | 15 53       | 4T90-50  | 7602-7   | 6T01-78  |
| 1094                      | RMP GYRO TEMPERATURE NO 2                   | RP2 GY T | ALOG       | 1/16     | A478      | 18 62       | 4T92-50  | 7602-9   | 6T01-79  |
| 1095                      | RMP PACKAGE TEMPERATURE NO 2                | RP2 PK T | ALOG       | 1/16     | A542      | 01 72       | 4T94-50  | 7602-10  | 6T01-80  |
| 1096                      | RMP INDICATED RATE (MEDIUM RESOLUTION) NO 2 | RP2 IR M | ALOG       | 1/1      | A616      | 09 02       | 4T96-17  | 7602-12  | 00/ 08   |
| 1097                      | RMP INDICATE RATE (HIGH RESOLUTION) NO 2    | RP2 IR H | ALOG       | 1/1      | A617      | 07 02       | 4T96-01  | 7602-11  | 6T01-R1  |
| 1098                      | RMP RELAY GROUP A STATUS NO 2               | RP2 ASTA | ALOG       | 1/16     | A091      | 12 07       | 4T80-69  | 7602-1   | 6T01-51  |
| 1099                      | RMP RELAY GROUP B STATUS NO 2               | RP2 BSTA | ALOG       | 1/16     | A155      | 15 16       | 4T82-69  | 7602-2   | 6T01-52  |
| INITIATION TIMER          |   |          |            |          |           |             |          |          |          |
| 1200                      | INITIATION TIMER T15                        | 15S TMR  | ALOG       | 1/16     | A218      | 15 25       | 4T84-43  | 8003-8   | 6T00-R4  |
| 1201                      | INITIATION TIMER T50                        | 50S TMR  | ALOG       | 1/16     | A284      | 02 35       | 4T86-30  | 8003-9   | 6T00-P5  |
| 1202                      | INITIATION TIMER RESET ON/OFF               | TMR RST  | DIG B      | 1/16     | A838      | 01 00       | 4T88-01  | 8003-7   | 6T00-R3  |
| PNEUMATICS                |   |          |            |          |           |             |          |          |          |
| 1210                      | GAS TANK TEMPERATURE                        | TANK T   | ALOG       | 1/16     | A349      | 10 44       | 4T88-29  | 7702-3   | 6T01-53  |
| 1211                      | MANIFOLD TEMPERATURE                        | MANFLD T | ALOG       | 1/16     | A413      | 12 53       | 4T90-29  | 7702-5   | 6T01-55  |
| 1212                      | GAS TANK PRESSURE (HIGH)                    | TANK P   | ALOG       | 1/16     | A477      | 15 62       | 4T92-29  | 7702-9   | 6T01-57  |
| 1213                      | MANIFOLD PRESSURE (LOW)                     | MANFLD P | ALOG       | 1/16     | A541      | 18 71       | 4T94-29  | 7702-7   | 6T01-56  |
| SOLAR ARRAY DRIVE (RIGHT) |   |          |            |          |           |             |          |          |          |
| 1220                      | SAD RIGHT MTR. WINDING VOLT                 | SDR MWDV | ALOG       | 1/1      | A619      | 09 00       | 4T96-36  | 7413-11  | 6T00-48  |
| 1221                      | SAD RIGHT TACH OUTPUT                       | SDR TACH | ALOG       | 1/1      | A520      | 05 03       | 4T96-15  | 7413-16  | 6T00-52  |
| 1222                      | SAD RIGHT MTR HOUSING TEMP                  | SDR MNGT | ALOG       | 1/16     | A090      | 10 07       | 4T80-43  | 7413-9   | 6T00-46  |
| 1223                      | SAD RIGHT MTR WINDING TEMP                  | SDR MWDT | ALOG       | 1/16     | A154      | 12 16       | 4T82-43  | 7413-10  | 6T00-47  |
| 1224                      | SAD RIGHT END SUN SENSOR TMP                | SDR FSST | ALOG       | 1/16     | A217      | 12 25       | 4T84-24  | 7413-22  | 6T00-58  |
| 1225                      | SAD RIGHT REAR SUN SENSOR TEMP              | SDR RSET | ALOG       | 1/16     | A283      | 01 35       | 4T86-69  | 7413-21  | 6T00-57  |
| 1226                      | SAD RIGHT SUN SENSOR PREAMP OUTPUT          | SDR SSPA | ALOG       | 1/16     | A348      | 08 44       | 4T88-30  | 7413-18  | 6T00-54  |
| 1227                      | SAD RIGHT +15V CONVERTER                    | SDR +15V | ALOG       | 1/16     | A412      | 10 53       | 4T90-30  | 7413-20  | 6T00-56  |
| 1228                      | SAD RIGHT HOUSING PRESSURE                  | SDR PRES | ALOG       | 1/16     | A476      | 12 62       | 4T92-30  | 7413-14  | 6T00-50  |
| 1229                      | SAD RIGHT RATE BIAS NORMAL/HIGH             | SDR RATE | DIG B      | 1/16     | 2850      | 15 01       | 4T04-34  | 7413-17  | 6T00-53  |
| 1230                      | SAD RIGHT PHASE SWITCH CW/CCW               | SDR PHSW | DIG B      | 1/16     | 2851      | 18 01       | 4T04-10  | 7413-12  | 6T00-49  |

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| FUNC NO.                 | TLM FUNCTION                      | ACRONYM  | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CCNN | JNT CCNN |
|--------------------------|-----------------------------------|----------|------------|----------|-----------|-------------|----------|----------|----------|
| SOLAR ARRAY DRIVE (LEFT) |                                   |          |            |          |           |             |          |          |          |
| 1240                     | SAD LEFT MTR WINDING VOLT         | SDL MWDV | ALOG       | 1/1      | A621      | 06 03       | 4T96-53  | 7423-11  | 6T01-20  |
| 1241                     | SAD LEFT TACH OUTPUT              | SDL TACH | ALOG       | 1/1      | A622      | 07 03       | 4T96-33  | 7423-16  | 6T01-24  |
| 1242                     | SAD LEFT MECH HOUSING TEMP        | SDL MHGT | ALOG       | 1/16     | A540      | 15 71       | 4T94-30  | 7423-9   | 6T01-18  |
| 1243                     | SAD LEFT MTR WINDING TEMP         | SDL MWDT | ALOG       | 1/16     | A089      | 07 07       | 4T80-24  | 7423-10  | 6T01-19  |
| 1244                     | SAD LEFT FWD SUN SENSOR TEMP      | SDL FSST | ALOG       | 1/16     | A153      | 10 16       | 4T82-24  | 7423-22  | 6T01-30  |
| 1245                     | SAD LEFT REAR S/S TEMP            | SDL RSST | ALOG       | 1/16     | A216      | 10 25       | 4T84-11  | 7423-21  | 6T01-29  |
| 1246                     | SAD LEFT SUN SENSOR PREAMP OUTPUT | SDL SSPA | ALOG       | 1/16     | A282      | 18 34       | 4T86-43  | 7423-18  | 6T01-26  |
| 1247                     | SAD LEFT -15V CONVERTER           | SDL -15V | ALOG       | 1/16     | A347      | 02 44       | 4T88-69  | 7423-20  | 6T01-28  |
| 1248                     | SAD LEFT HOUSING PRESSURE         | SDL PRES | ALOG       | 1/16     | A411      | 02 53       | 4T90-69  | 7423-14  | 6T01-22  |
| 1249                     | SAD LEFT RATE BIAS NORMAL/HI      | SDL RATE | DIG B      | 1/16     | 2B52      | 01 02       | 4T06-34  | 7423-17  | 6T01-25  |
| 1250                     | SAD LEFT PHASE SWITCH CW/CCW      | SDL PHSM | DIG B      | 1/16     | 2B53      | 02 02       | 4T06-10  | 7423-12  | 6T01-21  |

NOTE -- ALSO SEE ELECTRICAL INTERFACE S/S

ACS STRUCTURAL TEMPERATURES

|      |                                   |          |      |      |      |       |         |         |         |
|------|-----------------------------------|----------|------|------|------|-------|---------|---------|---------|
| 1260 | BASEPLATE 1 TEMP -Y               | TH01RP-Y | ALOG | 1/16 | A475 | 10 62 | 4T92-69 | 8102-17 | 6T01-76 |
| 1261 | BASEPLATE 2 TEMP X                | TH02RP X | ALOG | 1/16 | A539 | 12 71 | 4T94-69 | 8102-28 | 6T01-75 |
| 1262 | BASEPLATE 3 TEMP Y                | TH03RP Y | ALOG | 1/16 | A088 | 02 07 | 4T80-11 | 8102-29 | 6T01-74 |
| 1263 | THERMAL SHIELD 4 TEMP Y           | TH04TS Y | ALOG | 1/16 | A152 | 08 16 | 4T82-11 | 8102-31 | 6T01-73 |
| 1264 | THERMAL SHIELD 5 TEMP -X          | TH05TS-X | ALOG | 1/16 | A215 | 08 25 | 4T84-46 | 8102-12 | 6T01-72 |
| 1265 | THERMAL SHIELD 6 TEMP -Y          | TH06TS-Y | ALOG | 1/16 | A281 | 15 34 | 4T86-24 | 8102-11 | 6T01-71 |
| 1266 | THERMAL SHIELD 7 TEMP X           | TH07TS X | ALOG | 1/16 | A346 | 01 44 | 4T88-43 | 8102-10 | 6T01-70 |
| 1267 | THERMAL SHIELD 8 TEMP Z           | TH08TS Z | ALOG | 1/16 | A410 | 02 53 | 4T90-43 | 8102-30 | 6T01-77 |
| 1268 | LOUVER HOUSING XFWD 9 TEMP        | TH01LH X | ALOG | 1/16 | A474 | 02 62 | 4T92-43 | 8102-16 | 6T01-10 |
| 1269 | LOUVER HOUSING MIDDINT 10 TEMP    | TH02LH Y | ALOG | 1/16 | A538 | 10 71 | 4T94-43 | 8102-18 | 6T01-23 |
| 1270 | FWD IR SCANNER MTG 11 TMP         | TH01FSC  | ALOG | 1/16 | A087 | 01 07 | 4T80-46 | 8102-15 | 6T01-27 |
| 1271 | REAR IR SCANNER MTG 12 TEMP       | TH02RSC  | ALOG | 1/16 | A151 | 02 16 | 4T82-46 | 8102-14 | 6T01-35 |
| 1272 | PNEU CYL AT MTG INTERFACE 13 TEMP | TH01LCY  | ALOG | 1/16 | A214 | 02 25 | 4T84-13 | 8102-18 | 6T01-36 |
| 1273 | LOWER STRUCTURE AT BASE           |          |      |      |      |       |         |         |         |
|      | OF CYLINDER 14 TEMP               | TH01LSCB | ALOG | 1/16 | A290 | 12 34 | 4T86-11 | 8102-13 | 6T01-38 |
| 1274 | PNEU CYL TOP 15 TEMP              | TH01UCY  | ALOG | 1/16 | A345 | 18 43 | 4T88-24 | 8102-32 | 6T01-39 |
| 1275 | LEFT SAD RADIATOR 16 TEMP X       | TH01LRAD | ALOG | 1/16 | A247 | 15 32 | 4T86-72 | 8102-33 | 6T01-45 |
| 1276 | RIGHT SAD RADIATOR 17 TEMP -X     | TH01RRAD | ALOG | 1/16 | A473 | 02 62 | 4T92-24 | 8102-34 | 6T01-48 |
| 1277 | TCM ZFNER VOLTAGE                 | TCM ZN V | ALOG | 1/16 | A537 | 08 71 | 4T94-24 | 8102-20 | 6T01-84 |
| 1278 | YAW NOZZLE ARM 20 TEMP            | TH01YNZL | ALOG | 1/16 | A344 | 15 43 | 4T88-11 | 8102-37 | 6T01-83 |
| 1279 | RIGHT+X RADIATOR 18 TEMP          | TH01RR X | ALOG | 1/16 | A449 | 15 58 | 4T92-23 | 8102-35 | 6T01-49 |
| 1280 | LOUVER HOUSING -X END 19 TEMP     | TH03LH-X | ALOG | 1/16 | A456 | 15 59 | 4T92-12 | 8102-36 | 6T01-50 |

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\* NUMBER 2000 - ORBIT ADJUST SUBSYSTEM \*  
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018

| FUNC NO.         | TLH FUNCTION                     | ACRONYM  | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CCNN | INT CCNN |
|------------------|----------------------------------|----------|------------|----------|-----------|-------------|----------|----------|----------|
| ORBIT ADJUST S/S |                                  |          |            |          |           |             |          |          |          |
| 2001             | PROPELLANT TANK TEMPERATURE      | P TANK T | ALOG       | 1/16     | A086      | 18 06       | 4T80-13  | 5003-C   |          |
| 2003             | THRUST CHAMBER NO. 1 TEMPERATURE | CHMB 1 T | ALOG       | 1/16     | A341      | 08 43       | 4T88-51  | 5003-Y   |          |
| 2004             | THRUST CHAMBER NO. 2 TEMPERATURE | CHMB 2 T | ALOG       | 1/16     | A405      | 10 52       | 4T90-51  | 5003-Z   |          |
| 2005             | THRUST CHAMBER NO. 3 TEMPERATURE | CHMB 3 T | ALOG       | 1/16     | A469      | 12 61       | 4T92-51  | 5003-AA  |          |
| 2006             | LINE PRESSURE                    | LINE P   | ALOG       | 1/16     | A534      | 18 70       | 4T94-13  | 5003-R   |          |
| 2007             | SOLENOID VALVE NO. 1 ON/OFF      | SOLND 1  | DIG B      | 1/1      | 7834      | 17 02       | 4T04-77  | 5003-A   |          |
| 2008             | SOLENOID VALVE NO. 2 ON/OFF      | SOLND 2  | DIG B      | 1/1      | 7836      | 17 03       | 4T06-77  | 5003-C   |          |
| 2009             | SOLENOID VALVE NO. 3 ON/OFF      | SOLND 3  | DIG B      | 1/1      | 7837      | 16 04       | 4T06-70  | 5003-E   |          |

NOTE SEE ELECTRICAL INTERFACE S/S

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\* 3000 - ATTITUDE MEASUREMENT \*  
\* SENSAR SUBSYSTEM \*  
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C-10

| FUNC NO.                    | TLM FUNCTION                     | ACRONYM | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CCAN | INT CCNN |
|-----------------------------|----------------------------------|---------|------------|----------|-----------|-------------|----------|----------|----------|
| ATTITUDE MEASUREMENT SENSOR |                                  |         |            |          |           |             |          |          |          |
| 3000                        | +ROLL SIGNAL                     | ROLL +  | ALOG       | 1/1      | A623      | 09 03       | 4T96-18  | 5G03-A   |          |
| 3001                        | -ROLL SIGNAL                     | ROLL -  | ALOG       | 1/1      | A624      | 05 04       | 4T96-09  | 5G03-B   |          |
| 3002                        | +PITCH SIGNAL                    | PITCH + | ALOG       | 1/1      | A625      | 06 04       | 4T96-08  | 5G03-E   |          |
| 3003                        | -PITCH SIGNAL                    | PITCH - | ALOG       | 1/1      | A626      | 04 04       | 4T96-06  | 5G03-F   |          |
| 3004                        | TEMPERATURE NO.1 (CASE)          | CASE T1 | ALOG       | 1/16     | A408      | 18 52       | 4T90-11  | 5G03-J   |          |
| 3005                        | TEMPERATURE NO.2 (I.R. ASSEMBLY) | ASSY T2 | ALOG       | 1/16     | A472      | 01 62       | 4T92-11  | 5G03-K   |          |

NOTE SEE ELECTRICAL INTERFACE S/S

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\* MAGNETIC MOMENTS COMPENSATING AESY. \*  
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| FUNC NO. | TLM FUNCTION          | ACRONYM  | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /POW | VIP CONN | S/S CONN | IAT CONN |
|----------|-----------------------|----------|------------|----------|-----------|-------------|----------|----------|----------|
| 4001     | BOARD A1 TEMP         | A1 BRD T | ALOG       | 1/16     | A491      | 15 64       | 4T92-36  | 5G08-20  |          |
| 4002     | BOARD A2 TEMP         | A2 BRD T | ALOG       | 1/16     | A555      | 18 73       | 4T94-36  | 5G08-19  |          |
| 4003     | HALL SENSOR CURRENT   | HALL CUR | ALOG       | 1/16     | A064      | 15 03       | 4T80-10  | 5G08-21  |          |
| 4004     | YAW FLUX DENSITY      | Y FLUX D | ALOG       | 1/16     | A128      | 18 12       | 4T82-10  | 5G08-17  |          |
| 4005     | PITCH FLUX DENSITY    | P FLUX D | ALOG       | 1/16     | A384      | 10 49       | 4T90-10  | 5G08-16  |          |
| 4006     | ROLL FLUX DENSITY     | R FLUX D | ALOG       | 1/16     | A320      | 16 49       | 4T88-10  | 5G08-18  |          |
| 4007     | POWER ON/OFF          | POWER    | DIG B      | 1/16     | 1863      | 12 03       | 4T08-01  | 5G08-09  |          |
| 4008     | CAPACITOR DUMP/CHARGE | CAP      | DIG B      | 1/16     | 2839      | 02 00       | 4T08-02  | 5G08-10  |          |
| 4010     | POLARITY (+/-)        | POL      | DIG B      | 1/16     | 2841      | 10 00       | 4T02-19  | 5G08-07  |          |
| 4012     | CAPACITOR HI/LO       | CAPTANCE | DIG B      | 1/16     | 2843      | 15 00       | 4T04-19  | 5G08-12  |          |
| 4013     | YAW COIL OUT/IN       | Y COIL   | DIG B      | 1/16     | 2844      | 18 00       | 4T06-57  | 5G08-05  |          |
| 4014     | PITCH COIL OUT/IN     | P COIL   | DIG B      | 1/16     | 2845      | 01 01       | 4T06-10  | 5G08-04  |          |
| 4015     | ROLL COIL OUT/IN      | R COIL   | DIG B      | 1/16     | 2846      | 02 01       | 4T08-57  | 5G08-06  |          |

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\* NUMBER 5000 - MECHANICAL SUBSYSTEM \*  
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| FUNC NO. | TLM FUNCTION | ACRONYM | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CCAN | IAT CCNM |
|----------|--------------|---------|------------|----------|-----------|-------------|----------|----------|----------|
|----------|--------------|---------|------------|----------|-----------|-------------|----------|----------|----------|

MECHANICAL SUBSYSTEM

|      |                                |          |       |     |      |       |         |        |  |
|------|--------------------------------|----------|-------|-----|------|-------|---------|--------|--|
| 5001 | SQUID ARM POWER                | SOIB PWR | DIG B | 1/1 | 0833 | 16 02 | 4T02-39 | 5P30-A |  |
| 5002 | SPACECRAFT SEPARATION SW       | SEP SW   | DIG B | 1/1 | 0834 | 17 02 | 4T04-84 | 5P30-W |  |
| 5003 | JNFOLD TIMER 1 FIRED (2.5 SEC) | UF 1 2.5 | DIG B | 1/1 | 0835 | 16 03 | 4T04-39 | 5P30-C |  |
| 5004 | JNFOLD TIMER 2 FIRED (5.0 SEC) | UF 2 5.0 | DIG B | 1/1 | 0836 | 17 03 | 4T06-84 | 5P30-E |  |

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\* NUMBER 6000 - POWER SUBSYSTEM \*  
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C-16

| FUNC NO. | TLN FUNCTION | ACRONYM | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /POW | VIP CONN | S/S CCAA | INT CCNM |
|----------|--------------|---------|------------|----------|-----------|-------------|----------|----------|----------|
|----------|--------------|---------|------------|----------|-----------|-------------|----------|----------|----------|

BATTERIES 1 THRU 8

|      |                             |          |      |      |      |       |         |         |         |
|------|-----------------------------|----------|------|------|------|-------|---------|---------|---------|
| 5001 | BATTERY 1 DISCHARGE CURRENT | BAT1 DIS | ALOG | 1/16 | A096 | 08 08 | 4T80-16 | 1P04-02 | 5714-28 |
| 5002 | BATTERY 2 DISCHARGE CURRENT | BAT2 DIS | ALOG | 1/16 | A160 | 10 17 | 4T82-16 | 1P03-02 | 5712-18 |
| 5003 | BATTERY 3 DISCHARGE CURRENT | BAT3 DIS | ALOG | 1/16 | A224 | 12 26 | 4T84-16 | 1P21-02 | 5712-23 |
| 5004 | BATTERY 4 DISCHARGE CURRENT | BAT4 DIS | ALOG | 1/16 | A288 | 15 35 | 4T86-16 | 2P15-02 | 5710-59 |
| 5005 | BATTERY 5 DISCHARGE CURRENT | BAT5 DIS | ALOG | 1/16 | A352 | 18 44 | 4T88-16 | 3P04-02 |         |
| 5006 | BATTERY 6 DISCHARGE CURRENT | BAT6 DIS | ALOG | 1/16 | A416 | 01 54 | 4T90-16 | 4P03-02 | 5714-51 |
| 5007 | BATTERY 7 DISCHARGE CURRENT | BAT7 DIS | ALOG | 1/16 | A480 | 02 63 | 4T92-16 | 4P09-02 | 5714-55 |
| 5008 | BATTERY 8 DISCHARGE CURRENT | BAT8 DIS | ALOG | 1/16 | A544 | 08 72 | 4T94-16 | 4P15-02 | 5714-59 |

|      |                          |          |      |      |      |       |         |         |         |
|------|--------------------------|----------|------|------|------|-------|---------|---------|---------|
| 5011 | BATTERY 1 CHARGE CURRENT | BAT1 CHG | ALOG | 1/16 | A097 | 10 08 | 4T60-03 | 1P04-03 | 5714-29 |
| 5012 | BATTERY 2 CHARGE CURRENT | BAT2 CHG | ALOG | 1/16 | A161 | 12 17 | 4T62-03 | 1P03-03 | 5712-19 |
| 5013 | BATTERY 3 CHARGE CURRENT | BAT3 CHG | ALOG | 1/16 | A225 | 15 26 | 4T64-03 | 1P21-03 | 5712-24 |
| 5014 | BATTERY 4 CHARGE CURRENT | BAT4 CHG | ALOG | 1/16 | A289 | 18 35 | 4T66-03 | 2P15-03 | 5710-60 |
| 5015 | BATTERY 5 CHARGE CURRENT | BAT5 CHG | ALOG | 1/16 | A353 | 01 45 | 4T68-03 | 3P04-03 |         |
| 5016 | BATTERY 6 CHARGE CURRENT | BAT6 CHG | ALOG | 1/16 | A589 | 15 28 | 4T96-73 | 4P03-03 | 5714-52 |
| 5017 | BATTERY 7 CHARGE CURRENT | BAT7 CHG | ALOG | 1/16 | A481 | 08 63 | 4T92-03 | 4P09-03 | 5714-56 |
| 5018 | BATTERY 8 CHARGE CURRENT | BAT8 CHG | ALOG | 1/16 | A545 | 10 72 | 4T94-03 | 4P15-03 | 5714-60 |

|      |                   |          |      |      |      |       |         |         |         |
|------|-------------------|----------|------|------|------|-------|---------|---------|---------|
| 5021 | BATTERY 1 VOLTAGE | BAT1 VLT | ALOG | 1/16 | A098 | 12 08 | 4T60-07 | 1P04-04 | 5714-30 |
| 5022 | BATTERY 2 VOLTAGE | BAT2 VLT | ALOG | 1/16 | A162 | 15 17 | 4T62-07 | 1P03-04 | 5712-20 |
| 5023 | BATTERY 3 VOLTAGE | BAT3 VLT | ALOG | 1/16 | A226 | 18 26 | 4T64-07 | 1P21-04 | 5712-25 |
| 5024 | BATTERY 4 VOLTAGE | BAT4 VLT | ALOG | 1/16 | A290 | 01 36 | 4T66-07 | 2P15-04 | 5710-61 |
| 5025 | BATTERY 5 VOLTAGE | BAT5 VLT | ALOG | 1/16 | A354 | 02 45 | 4T68-07 | 3P04-04 |         |
| 5026 | BATTERY 6 VOLTAGE | BAT6 VLT | ALOG | 1/16 | A418 | 08 54 | 4T90-07 | 4P03-04 | 5714-53 |
| 5027 | BATTERY 7 VOLTAGE | BAT7 VLT | ALOG | 1/16 | A482 | 10 63 | 4T92-07 | 4P09-04 | 5714-57 |
| 5028 | BATTERY 8 VOLTAGE | BAT8 VLT | ALOG | 1/16 | A546 | 10 72 | 4T94-07 | 4P15-04 | 5714-61 |

|      |                           |          |      |      |      |       |         |         |         |
|------|---------------------------|----------|------|------|------|-------|---------|---------|---------|
| 5031 | BATTERY NO. 1 TEMPERATURE | BAT1 TMP | ALOG | 1/16 | A099 | 15 08 | 4T80-82 | 1E04-05 | 5714-31 |
| 5032 | BATTERY NO. 2 TEMPERATURE | BAT2 TMP | ALOG | 1/16 | A163 | 18 17 | 4T82-82 | 1P03-05 | 5712-21 |
| 5033 | BATTERY NO. 3 TEMPERATURE | BAT3 TMP | ALOG | 1/16 | A227 | 01 27 | 4T84-82 | 1P21-05 | 5712-26 |
| 5034 | BATTERY NO. 4 TEMPERATURE | BAT4 TMP | ALOG | 1/16 | A291 | 02 36 | 4T86-82 | 2P15-05 | 5710-62 |
| 5035 | BATTERY NO. 5 TEMPERATURE | BAT5 TMP | ALOG | 1/16 | A355 | 08 45 | 4T88-82 | 3P04-05 |         |
| 5036 | BATTERY NO. 6 TEMPERATURE | BAT6 TMP | ALOG | 1/16 | A419 | 10 54 | 4T90-82 | 4P03-05 | 5714-54 |
| 5037 | BATTERY NO. 7 TEMPERATURE | BAT7 TMP | ALOG | 1/16 | A483 | 12 63 | 4T92-82 | 4P09-05 | 5714-58 |
| 5038 | BATTERY NO. 8 TEMPERATURE | BAT8 TMP | ALOG | 1/16 | A547 | 15 72 | 4T94-82 | 4P15-05 | 5714-62 |

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| FUNC NO.                          | TLM FUNCTION                         | ACRONYM                   | SIGNL TYPE          | SAMP SEC        | GATE ADDR       | COLUMN /ROW      | VIP CONN           | S/S CCM             | INT CCM             |
|-----------------------------------|--------------------------------------|---------------------------|---------------------|-----------------|-----------------|------------------|--------------------|---------------------|---------------------|
| 6040                              | 502 PADDLE TEMPERATURE               | RT PAD T                  | ALOG                | 1/16            | A292            | 08 36            | 4T86-52            | 7417-P              | 5715-31             |
| <del>6041</del>                   | <del>502 PADDLE VOLTAGE #W</del>     | <del>RPAD V P</del>       | <del>ALOG</del>     | <del>1/16</del> | <del>A357</del> | <del>12 45</del> | <del>4T88-31</del> | <del>7417-R</del>   | <del>5715-28</del>  |
| 6042                              | 502 PADDLE VOLTAGE #M                | RPAD V O                  | ALOG                | 1/16            | A294            | 12 36            | 4T86-54            | 7417-S              | 5715-29             |
| SOLAR ARRAY PADDLE 501 (LEFT)     |                                      |                           |                     |                 |                 |                  |                    |                     |                     |
| 6044                              | 501 PADDLE TEMPERATURE               | LT PAD T                  | ALOG                | 1/16            | A356            | 10 45            | 4T88-52            | 7427-P              | 5715-30             |
| <del>6045</del>                   | <del>501 PADDLE VOLTAGE #F</del>     | <del>LPAD V F</del>       | <del>ALOG</del>     | <del>1/16</del> | <del>A293</del> | <del>10 36</del> | <del>4T86-31</del> | <del>7427-S</del>   | <del>5715-27</del>  |
| 6046                              | 501 PADDLE VOLTAGE #G                | LPAD V G                  | ALOG                | 1/16            | A358            | 15 45            | 4T88-54            | 7427-R              | 5715-26             |
| POWER CONTROL MODULE (PCM)        |                                      |                           |                     |                 |                 |                  |                    |                     |                     |
| 6050                              | UNREGULATED BUS VOLTAGE              | UR BUS V                  | ALOG                | 1/16            | A100            | 1A 08            | 4T80-52            | 2F03-04             | 5710-63             |
| <del>6051</del>                   | <del>REGULATED BUS VOLTAGE</del>     | <del>RG BUS V</del>       | <del>ALOG</del>     | <del>1/16</del> | <del>A165</del> | <del>02 18</del> | <del>4T82-31</del> | <del>2F03-05</del>  | <del>5710-64</del>  |
| 6052                              | AUXILIARY REGULATOR #A# VOLTAGE      | AUX A V                   | ALOG                | 1/16            | A164            | 01 18            | 4T82-52            | 2F03-06             | 5710-65             |
| 6053                              | AUXILIARY REGULATOR #B# VOLTAGE      | AUX B V                   | ALOG                | 1/16            | A228            | 02 27            | 4T84-52            | 2F03-07             | 5710-66             |
| <del>6054</del>                   | <del>SOLAR ARRAY CURRENT</del>       | <del>SOLAR I</del>        | <del>ALOG</del>     | <del>1/16</del> | <del>A101</del> | <del>01 09</del> | <del>4T80-31</del> | <del>2F03-08</del>  | <del>5710-67</del>  |
| 6055                              | REGULATED BUS CURRENT                | RG BUS I                  | ALOG                | 1/1             | A600            | 11 00            | 4T96-11            | 2F03-10             | 5710-68 FM 10-11    |
| 6056                              | REGULATED BUS CURRENT                | RG BUS I                  | ALOG                | 1/1             | A618            | 04 03            | 4T96-81            | 2F03-09             | 5710-69             |
| <del>6058</del>                   | <del>PCM THERMISTOR NO. 43</del>     | <del>40T SPOT (RT1)</del> | <del>PCMOD T1</del> | <del>ALOG</del> | <del>1/16</del> | <del>A192</del>  | <del>01 22</del>   | <del>4T84-10</del>  | <del>F5T04-36</del> |
| 6059                              | PCM THERMISTOR NO. 35                | PCMOD T2                  | ALOG                | 1/16            | A256            | 02 31            | 4T86-10            | F5T10-11            |                     |
| <del>6060</del>                   | <del>MODULE TEMP (RT2)</del>         | <del>PCMOD T2</del>       | <del>ALOG</del>     | <del>1/16</del> | <del>A256</del> | <del>02 31</del> | <del>4T86-10</del> | <del>F5T10-11</del> |                     |
| 6060                              | TRICKLE CHARGE OVERRIDE/NORMAL       | TRML CHG                  | DIG B               | 1/16            | 0B58            | 1P 02            | 4T04-23            | 2F03-15             | 5710-70             |
| 6061                              | PWM REGULATOR 1/2                    | PWM REG                   | DIG B               | 1/16            | 0B44            | 1P 00            | 4T06-68            | 2F03-02             | 5710-71             |
| PAYLOAD REGULATOR MODULE (PRM)    |                                      |                           |                     |                 |                 |                  |                    |                     |                     |
| 6070                              | PAYLOAD REG. BUS VOLTAGE             | PRG BS V                  | ALOG                | 1/16            | A260            | 02 23            | 4T84-12            | 1P09-05             | 5712-22             |
| 6071                              | PAYLOAD UNREG. BUS VOLTAGE           | PUR BS V                  | ALOG                | 1/16            | A265            | 10 32            | 4T86-26            | 1P09-04             | 5712-27             |
| 6072                              | PAYLOAD REG. BUS CURRENT             | PRG BS I                  | ALOG                | 1/1             | A615            | 11 03            | 4T96-34            | 1P09-10             | 5712-28 FM 10-11    |
| 6073                              | PAYLOAD AUX. REG. VOLTAGE A          | PAUX A V                  | ALOG                | 1/16            | A264            | 08 32            | 4T86-12            | 1P09-06             | 5712-29             |
| 6074                              | PAYLOAD AUX. REG. VOLTAGE B          | PAUX B V                  | ALOG                | 1/16            | A328            | 10 41            | 4T88-12            | 1P09-07             | 5712-30             |
| 6075                              | PRM THERMISTOR NO. 38 TOP OUTBOARD   | PRMOD T1                  | ALOG                | 1/16            | A193            | 02 22            | 4T84-23            | F5T12-17            |                     |
| 6076                              | PRM THERMISTOR NO. 69 CENTER INBOARD | PRMOD T2                  | ALOG                | 1/16            | A257            | 08 31            | 4T86-23            | F5T12-18            |                     |
| 6077                              | PWM REGULATOR 3/4                    | PWM REG                   | DIG B               | 1/16            | 0B43            | 15 00            | 4T04-40            | 1P09-02             | 5712-31             |
| 6100                              | PAYLOAD REG. BUS CURRENT             | PRG BS I                  | ALOG                | 1/1             | A633            | 17 04            | 4T96-02            | 1P09-09             | 5712-16             |
| NOTE SEE ELECTRICAL INTERFACE S/S |                                      |                           |                     |                 |                 |                  |                    |                     |                     |

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\* NUMBER 7000 - THERMAL SUBSYSTEM \*  
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| FUNC NO.          | TLM FUNCTION                      | ACRONYM | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CCAN | INT CONN |
|-------------------|-----------------------------------|---------|------------|----------|-----------|-------------|----------|----------|----------|
| THERMAL SUBSYSTEM |                                   |         |            |          |           |             |          |          |          |
| 7001              | SEPARATOR NO. 1, TOP INBOARD      | TH01STI | ALOG       | 1/16     | A120      | 15 11       | 4TB0-05  | 5T04-07  |          |
| 7002              | SEPARATOR NO. 2, BOTTOM OUTBOARD  | TH02SBO | ALOG       | 1/16     | A121      | 18 11       | 4TB0-02  | 5T12-07  |          |
| 7003              | SEPARATOR NO. 3, TOP INBOARD      | TH03STI | ALOG       | 1/16     | A122      | 01 12       | 4TB0-19  | 5T20-07  |          |
| 7004              | TEMP CONTROL BELLOW NO. 10        | TH01TCB | ALOG       | 1/16     | A123      | 02 12       | 4TB0-74  | 5T04-25  |          |
| 7005              | SEPARATOR NO. 4, TOP INBOARD      | TH04STI | ALOG       | 1/16     | A124      | 08 12       | 4TB0-74  | 5T12-25  |          |
| 7006              | SEPARATOR NO. 5, BOTTOM OUTBOARD  | TH05SBO | ALOG       | 1/16     | A125      | 10 12       | 4TB0-58  | 5T20-25  |          |
| 7007              | BEAK BULKHEAD GAS-X THRUSTER      | TH0AS-X | ALOG       | 1/16     | A126      | 12 12       | 4TB0-35  | 5T04-26  |          |
| 7008              | SEPARATOR NO. 6, TOP OUTBOARD     | TH06STO | ALOG       | 1/16     | A127      | 15 12       | 4TB0-57  | 5T12-26  |          |
| 7009              | SEPARATOR NO. 6, BOTTOM INBOARD   | TH06SBI | ALOG       | 1/16     | A184      | 18 20       | 4TB2-05  | 5T20-26  |          |
| 7010              | SEPARATOR NO. 7, TOP INBOARD      | TH07STI | ALOG       | 1/16     | A185      | 04 21       | 4TB2-02  | 5T04-19  |          |
| 7011              | SEPARATOR NO. 8, TOP OUTBOARD     | TH08STO | ALOG       | 1/16     | A186      | 02 21       | 4TB2-19  | 5T12-19  |          |
| 7012              | SEPARATOR NO. 9, BOTTOM INBOARD   | TH09SBI | ALOG       | 1/16     | A187      | 08 21       | 4TB2-78  | 5T20-19  |          |
| 7013              | SEPARATOR NO. 10, BOTTOM OUTBOARD | TH10SBO | ALOG       | 1/16     | A188      | 10 21       | 4TB2-79  | 5T04-35  |          |
| 7014              | SEPARATOR NO. 11, TOP INBOARD     | TH11STI | ALOG       | 1/16     | A189      | 12 21       | 4TB2-58  | 5T12-35  |          |
| 7015              | SEPARATOR NO. 12, BOTTOM OUTBOARD | TH12SBO | ALOG       | 1/16     | A190      | 15 21       | 4TB2-35  | 5T20-35  |          |
| 7016              | SEPARATOR NO. 13, TOP INBOARD     | TH13STI | ALOG       | 1/16     | A191      | 18 21       | 4TB2-57  | 5T04-33  |          |
| 7017              | RV BEAM CENTER LINE               | THRBVCL | ALOG       | 1/16     | A248      | 01 30       | 4TB4-05  | 5T12-33  |          |
| 7018              | SEPARATOR NO. 14, TOP OUTBOARD    | TH14STO | ALOG       | 1/16     | A249      | 02 30       | 4TB4-02  | 5T20-33  |          |
| 7019              | VRTR RADIATOR BAY 4, OUTBOARD     | TH04NRB | ALOG       | 1/16     | A250      | 08 30       | 4TB4-19  | 5T04-31  |          |
| 7020              | SEPARATOR NO. 15, BOTTOM INBOARD  | TH15SBI | ALOG       | 1/16     | A251      | 10 30       | 4TB4-78  | 5T12-31  |          |
| 7021              | SEPARATOR NO. 16, TOP INBOARD     | TH16STI | ALOG       | 1/16     | A252      | 12 30       | 4TB4-74  | 5T20-31  |          |
| 7022              | SEPARATOR NO. 17, BOTTOM INBOARD  | TH17SBI | ALOG       | 1/16     | A253      | 15 30       | 4TB4-56  | 5T04-29  |          |
| 7023              | SEPARATOR NO. 18, BOTTOM OUTBOARD | TH18SBO | ALOG       | 1/16     | A254      | 18 30       | 4TB4-35  | 5T12-29  |          |
| 7030              | JPPER RING AT BAY NO. 3           | TH03PJR | ALOG       | 1/16     | A255      | 01 31       | 4TB4-57  | 5T20-29  |          |
| 7033              | JPPER RING AT BAY NO. 12          | TH12PJR | ALOG       | 1/16     | A314      | 10 32       | 4TB6-15  | 5T20-16  |          |
| 7035              | JPPER RING AT BAY NO. 18          | TH18PJR | ALOG       | 1/16     | A316      | 15 39       | 4TB6-79  | 5T12-14  |          |
| 7040              | TEMPERATURE CONTROL BELLOW NO. 1  | TH01TCB | ALOG       | 1/16     | A317      | 18 39       | 4TB6-58  | 5T20-14  |          |
| 7041              | TEMPERATURE CONTROL BELLOW NO. 2  | TH02TCB | ALOG       | 1/16     | A318      | 01 40       | 4TB6-35  | 5T04-12  |          |
| 7042              | TEMPERATURE CONTROL BELLOW NO. 3  | TH03TCB | ALOG       | 1/16     | A319      | 02 40       | 4TB6-57  | 5T12-12  |          |
| 7043              | TEMPERATURE CONTROL BELLOW NO. 4  | TH04TCB | ALOG       | 1/16     | A376      | 08 48       | 4TB8-05  | 5T20-12  |          |
| 7044              | TEMPERATURE CONTROL BELLOW NO. 5  | TH05TCB | ALOG       | 1/16     | A377      | 10 48       | 4TB8-02  | 5T04-11  |          |
| 7045              | TEMPERATURE CONTROL BELLOW NO. 7  | TH07TCB | ALOG       | 1/16     | A378      | 12 48       | 4TB8-19  | 5T20-11  |          |
| 7046              | TEMPERATURE CONTROL BELLOW NO. 9  | TH09TCB | ALOG       | 1/16     | A379      | 15 48       | 4TB8-78  | 5T04-17  |          |
| 7047              | SPARE                             |         |            |          |           |             |          |          |          |
| 7048              | TEMPERATURE CONTROL BELLOW NO. 11 | TH11TCB | ALOG       | 1/16     | A380      | 18 48       | 4TB8-79  | 5T20-17  |          |
| 7049              | TEMPERATURE CONTROL BELLOW NO. 12 | TH12TCB | ALOG       | 1/16     | A381      | 01 49       | 4TB8-58  | 5T04-37  |          |
| 7050              | TEMPERATURE CONTROL BELLOW NO. 13 | TH13TCB | ALOG       | 1/16     | A382      | 02 49       | 4TB8-35  | 5T12-37  |          |
| 7051              | TEMPERATURE CONTROL BELLOW NO. 14 | TH14TCB | ALOG       | 1/16     | A383      | 08 49       | 4TB8-57  | 5T20-37  |          |
| 7052              | TEMPERATURE CONTROL BELLOW NO. 16 | TH16TCB | ALOG       | 1/16     | A440      | 10 57       | 4T90-05  | 5T12-36  |          |
| 7053              | TEMPERATURE CONTROL BELLOW NO. 17 | TH17TCB | ALOG       | 1/16     | A441      | 15 58       | 4T94-28  | 5T20-36  |          |
| 7054              | TEMPERATURE CONTROL BELLOW NO. 18 | TH18TCB | ALOG       | 1/16     | A442      | 15 57       | 4T90-19  | 5T04-34  |          |
| 7060              | SHUTTER ASSEMBLY, BAY NO. 1       | SH01    | ALOG       | 1/16     | A119      | 12 11       | 4TB0-56  | 5T04-23  |          |

| FJNC NO. | TLM FUNCTION                          | ACRONYM           | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CCNN | INT CCNN |
|----------|---------------------------------------|-------------------|------------|----------|-----------|-------------|----------|----------|----------|
| 7061     | SHUTTER ASSEMBLY RAY NO. 2            | SH <sub>n2</sub>  | ALOG       | 1/16     | A183      | 15 20       | 4T82-56  | 5T12-23  |          |
| 7062     | SHUTTER ASSEMBLY RAY NO. 3            | SH <sub>n3</sub>  | ALOG       | 1/16     | A223      | 10 26       | 4T84-74  | 5T20-23  |          |
| 7063     | SHUTTER ASSEMBLY RAY NO. 4            | SH <sub>n4</sub>  | ALOG       | 1/16     | A311      | 01 39       | 4T86-56  | 5T04-21  |          |
| 7064     | SHUTTER ASSEMBLY RAY NO. 5            | SH <sub>n5</sub>  | ALOG       | 1/16     | A375      | 02 48       | 4T88-56  | 5T12-21  |          |
| 7065     | SHUTTER ASSEMBLY RAY NO. 7            | SH <sub>n7</sub>  | ALOG       | 1/16     | A439      | 08 57       | 4T90-56  | 5T04-22  |          |
| 7066     | SHUTTER ASSEMBLY RAY NO. 9            | SH <sub>n9</sub>  | ALOG       | 1/16     | A567      | 12 75       | 4T94-56  | 5T20-22  |          |
| 7068     | SHUTTER ASSEMBLY RAY NO. 10           | SH <sub>n10</sub> | ALOG       | 1/16     | A118      | 10 11       | 4T80-55  | 5T04-4   |          |
| 7069     | SHUTTER ASSEMBLY RAY NO. 11           | SH <sub>n11</sub> | ALOG       | 1/16     | A182      | 12 20       | 4T82-55  | 5T12-4   |          |
| 7070     | SHUTTER ASSEMBLY RAY NO. 12           | SH <sub>n12</sub> | ALOG       | 1/16     | A222      | 08 26       | 4T84-55  | 5T20-4   |          |
| 7071     | SHUTTER ASSEMBLY RAY NO. 13           | SH <sub>n13</sub> | ALOG       | 1/16     | A310      | 18 38       | 4T86-55  | 5T04-3   |          |
| 7072     | SHUTTER ASSEMBLY RAY NO. 14           | SH <sub>n14</sub> | ALOG       | 1/16     | A374      | 01 48       | 4T88-55  | 5T12-3   |          |
| 7073     | SHUTTER ASSEMBLY RAY NO. 15           | SH <sub>n15</sub> | ALOG       | 1/16     | A438      | 02 57       | 4T90-55  | 5T20-3   |          |
| 7074     | SHUTTER ASSEMBLY RAY NO. 16           | SH <sub>n16</sub> | ALOG       | 1/16     | A501      | 02 66       | 4T92-32  | 5T04-2   |          |
| 7075     | SHUTTER ASSEMBLY RAY NO. 17           | SH <sub>n17</sub> | ALOG       | 1/16     | A566      | 10 75       | 4T94-55  | 5T12-2   |          |
| 7076     | SHUTTER ASSEMBLY RAY NO. 18           | SH <sub>n18</sub> | ALOG       | 1/16     | A117      | 08 11       | 4T80-32  | 5T20-2   |          |
| 7080     | I/M CONV. MOD., 01 THER. ZENER        | ZNV01TH           | ALOG       | 1/16     | A181      | 10 20       | 4T82-32  | 5T04-20  |          |
| 7081     | I/M CONV. MOD., 02 THER. ZENER        | ZNV02TH           | ALOG       | 1/16     | A221      | 02 26       | 4T84-29  | 5T12-20  |          |
| 7082     | I/M CONV. MOD., 03 THER. ZENER        | ZNV03TH           | ALOG       | 1/16     | A309      | 15 38       | 4T86-32  | 5T20-20  |          |
| 7083     | I/M CONV. MOD., 01 SHUTTER ZENER      | ZNV01SH           | ALOG       | 1/16     | A373      | 18 47       | 4T88-32  | 5T04-6   |          |
| 7084     | I/M CONV. MOD., 02 SHUTTER ZENER      | ZNV02SH           | ALOG       | 1/16     | A437      | 01 57       | 4T90-32  | 5T12-6   |          |
| 7085     | I/M CONV. MOD., 03 SHUTTER ZENER      | ZNV03SH           | ALOG       | 1/16     | A500      | 01 66       | 4T92-77  | 5T20-6   |          |
| 7090     | PSM MOUNT                             | THPSM             | ALOG       | 1/16     | A443      | 18 57       | 4T90-70  | 5T12-18  |          |
| 7091     | INDEPENDANT ATTITUDE SENSOR MTG.      | THIASM            | ALOG       | 1/16     | A444      | 01 58       | 4T90-79  | 5T12-34  |          |
| 7092     | RBV RADIATOR                          | THRBVR            | ALOG       | 1/16     | A445      | 02 58       | 4T90-58  | 5T20-34  |          |
| 7093     | RBV CAMERA SUPPORT BEAM(CENTER)       | THRBVRC           | ALOG       | 1/16     | A446      | 08 58       | 4T90-35  | 5T20-32  |          |
| 7094     | RBVTR RADIATOR (ROOT)                 | THWBRR            | ALOG       | 1/16     | A447      | 10 58       | 4T90-57  | 5T04-32  |          |
| 7095     | RBVTR RADIATOR (CENTER)               | THWBRR            | ALOG       | 1/16     | A504      | 12 66       | 4T92-05  | 5T12-32  |          |
| 7096     | RBVTR HEAT STRAP                      | THWBRRS           | ALOG       | 1/16     | A505      | 15 66       | 4T92-02  | 5T12-10  |          |
| 7097     | RB ELECTRONICS MOUNT OVER BAY NO. 1   | TH01WRE           | ALOG       | 1/16     | A506      | 18 66       | 4T92-19  | 5T20-10  |          |
| 7098     | RB ELECTRONICS MOUNT OVER BAY NO. 18  | TH18WRE           | ALOG       | 1/16     | A507      | 01 67       | 4T92-75  | 5T04-18  |          |
| 7099     | RBVTR 1. INBOARD OF SEPARATOR 3       | TH03WRR           | ALOG       | 1/16     | A508      | 02 67       | 4T92-79  | 5T04-30  |          |
| 7100     | RBVTR 1. INBOARD OF SEPARATOR 17      | TH17WRR           | ALOG       | 1/16     | A509      | 08 67       | 4T92-54  | 5T12-30  |          |
| 7101     | RBVTR 1. CENTER                       | THC1WRR           | ALOG       | 1/16     | A510      | 10 67       | 4T92-35  | 5T20-30  |          |
| 7102     | RBVTR 2. INBOARD OF RAY 4             | TH04WRR           | ALOG       | 1/16     | A511      | 12 67       | 4T92-57  | 5T04-28  |          |
| 7103     | RBVTR 2. REAM INBOARD OF RAY 15       | TH15WRR           | ALOG       | 1/16     | A568      | 15 75       | 4T94-05  | 5T12-28  |          |
| 7104     | RBVTR 2. REAM CENTER                  | THC2WRR           | ALOG       | 1/16     | A569      | 18 75       | 4T94-02  | 5T20-28  |          |
| 7105     | RBVTR BEAM INBOARD OF SEPARATOR NO.6  | TH06WRR           | ALOG       | 1/16     | A570      | 01 76       | 4T94-19  | 5T04-15  |          |
| 7106     | RBVTR BEAM INBOARD OF SEPARATOR NO.14 | TH14WRR           | ALOG       | 1/16     | A571      | 02 76       | 4T94-78  | 5T12-15  |          |
| 7107     | RBVTR BEAM CENTER                     | THC4WRR           | ALOG       | 1/16     | A572      | 08 75       | 4T94-79  | 5T20-15  |          |
| 7108     | YSS MOUNT NEAR SEPARATOR NO. 14       | TH14YSS           | ALOG       | 1/16     | A573      | 10 76       | 4T94-58  | 5T04-13  |          |
| 7109     | REAR BULKHEAD GAS -Y THRUSTER         | TH-YOAS           | ALOG       | 1/16     | A574      | 12 76       | 4T94-35  | 5T12-13  |          |
| 7110     | YSS MOUNT NEAR CENTER OF RBVTR BEAM   | THC4YSS           | ALOG       | 1/16     | A575      | 15 76       | 4T94-57  | 5T20-13  |          |
| 7111     | REAR BULKHEAD GAS X THRUSTER          | TH-XOAS           | ALOG       | 1/16     | A503      | 10 66       | 4T92-56  | 5T04-10  |          |

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\* NUMBERS 8000, 9000, 10000, + 12000 \*  
\* COMMUNICATIONS AND DATA HANDLING \*  
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| FJNC NO.              | TLM FUNCTION                         | ACRONYM  | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CCAN | TAT CCAN |
|-----------------------|--------------------------------------|----------|------------|----------|-----------|-------------|----------|----------|----------|
| COMMAND CLOCK NO.8000 |                                      |          |            |          |           |             |          |          |          |
| 9001                  | PRIMARY W CHANNEL INPUT (DATA)       | PRI W IN | ALOG       | 1/16     | A116      | 02 11       | 4T80-77  | 2C13-37  | 5710-01  |
| 9002                  | PRIMARY X CHANNEL INPUT (STROBE)     | PRI X IN | ALOG       | 1/16     | A180      | 08 20       | 4T82-77  | 2C13-36  | 5710-02  |
| 9003                  | REDUNDANT W CHANNEL INPUT (DATA)     | RED W IN | ALOG       | 1/16     | A114      | 18 10       | 4T80-06  | 2C13-08  | 5710-03  |
| 9004                  | REDUNDANT X CHANNEL INPUT (STROBE)   | RED X IN | ALOG       | 1/16     | A178      | 01 20       | 4T82-06  | 2C13-23  | 5710-04  |
| 9005                  | PRIMARY POWER SUPPLY TEMPERATURE     | PPS TEMP | ALOG       | 1/16     | A247      | 18 29       | 4T84-56  | 2C13-30  | 5710-05  |
| 9006                  | REDUNDANT POWER SUPPLY TEMPERATURE   | RPS TEMP | ALOG       | 1/16     | A245      | 12 29       | 4T84-32  | 2C13-29  | 5710-06  |
| 9007                  | PRIMARY OSCILLATOR TEMPERATURE       | POSC TMP | ALOG       | 1/16     | A308      | 12 38       | 4T86-77  | 2C13-33  | 5710-07  |
| 9008                  | REDUNDANT OSCILLATOR TEMPERATURE     | ROSC TMP | ALOG       | 1/16     | A306      | 08 38       | 4T86-06  | 2C13-32  | 5710-08  |
| 9009                  | PRIMARY OSCILLATOR OUTPUT            | POSC OUT | ALOG       | 1/16     | A372      | 15 47       | 4T88-77  | 2C13-31  | 5710-09  |
| 9010                  | REDUNDANT OSCILLATOR OUTPUT          | ROSC OUT | ALOG       | 1/16     | A370      | 10 47       | 4T88-06  | 2C13-28  | 5710-10  |
| 9011                  | 100 KHZ MASTER CLOCK                 | 100KHZ   | ALOG       | 1/16     | A371      | 12 47       | 4T88-80  | 2C13-18  | 5710-11  |
| 9012                  | 10 KHZ                               | 10KHZ    | ALOG       | 1/16     | A435      | 15 56       | 4T90-80  | 2C13-09  | 5710-12  |
| 9013                  | 2.5 KHZ                              | 2.5KHZ   | ALOG       | 1/16     | A498      | 15 65       | 4T92-06  | 2C13-34  | 5710-13  |
| 9014                  | 400 HZ PH A/PH B                     | 400HZ AB | ALOG       | 1/16     | A564      | 02 75       | 4T94-77  | 2C13-22  | 5710-14  |
| 9015                  | PRIMARY 4 VDC                        | PRI 4V   | ALOG       | 1/16     | A436      | 18 56       | 4T90-77  | 2C13-04  | 5710-15  |
| 9016                  | REDUNDANT 4VDC                       | RED 4V   | ALOG       | 1/16     | A434      | 12 56       | 4T90-06  | 2C13-11  | 5710-16  |
| 9017                  | PRIMARY 6.0 VDC                      | PRI 6V   | ALOG       | 1/16     | A499      | 18 65       | 4T92-80  | 2C13-10  | 5710-17  |
| 9018                  | REDUNDANT 6.0 VDC                    | RED 6V   | ALOG       | 1/16     | A497      | 12 65       | 4T92-08  | 2C13-05  | 5710-18  |
| 9019                  | PRIMARY -6.0 VDC                     | PRI -6V  | ALOG       | 1/16     | A565      | 08 75       | 4T94-32  | 2C13-15  | 5710-19  |
| 9020                  | REDUNDANT -6.0 VDC                   | RED -6V  | ALOG       | 1/16     | A563      | 01 75       | 4T94-80  | 2C13-06  | 5710-20  |
| 9021                  | PRIMARY -23 VDC                      | PRI -23V | ALOG       | 1/16     | A115      | 01 11       | 4T80-80  | 2C13-01  | 5710-21  |
| 9022                  | REDUNDANT -23VDC                     | RED -23V | ALOG       | 1/16     | A246      | 15 29       | 4T84-55  | 2C13-02  | 5710-22  |
| 9023                  | PRIMARY -29VDC                       | PRI -29V | ALOG       | 1/16     | A179      | 02 20       | 4T82-80  | 2C13-13  | 5710-23  |
| 9024                  | REDUNDANT -29VDC                     | RED -29V | ALOG       | 1/16     | A307      | 10 38       | 4T86-80  | 2C13-07  | 5710-24  |
| 9025                  | PRIMARY POWER SUPPLY ON/OFF          | PPWR SUP | DIG B      | 1/16     | 7B62      | 10 03       | 4T08-76  | 2C11-17  | 5710-25  |
| 9026                  | REDUNDANT POWER SUPPLY ON/OFF        | RPWR SHP | DIG B      | 1/16     | 1B39      | 02 00       | 4T08-41  | 2C11-33  | 5710-26  |
| 9027                  | POWER SUPPLY SELECT PRI./RED.        | PWR SLC  | DIG B      | 1/16     | 0B41      | 10 00       | 4T02-40  | 2C11-16  | 5710-27  |
| 9028                  | PRIMARY COMSTOR ON/OFF               | PCOMSTOR | DIG B      | 1/16     | 1B45      | 01 01       | 4T06-42  | 2C11-19  | 5710-28  |
| 9029                  | REDUNDANT COMSTOR ON/OFF             | RCOMSTOR | DIG B      | 1/16     | 0B40      | 08 00       | 4T02-68  | 2C11-36  | 5710-29  |
| 9030                  | MATRIX DECODER PRIMARY/REDUNDANT     | MTX DCDB | DIG B      | 1/16     | 0B42      | 12 00       | 4T04-68  | 2C11-08  | 5710-30  |
| 9031                  | MATRIX DRIVER A PRIMARY/REDUNDANT    | MTX DR A | DIG B      | 1/16     | 1B52      | 01 02       | 4T06-20  | 2C11-02  | 5710-31  |
| 9032                  | MATRIX DRIVER B PRIMARY/REDUNDANT    | MTX DR B | DIG B      | 1/16     | 0B49      | 12 01       | 4T02-38  | 2C11-24  | 5710-32  |
| 9033                  | FREQUENCY GEN. PRIMARY/REDUNDANT     | FREQ GEN | DIG B      | 1/16     | 0B47      | 08 01       | 4T08-40  | 2C11-09  | 5710-33  |
| 9034                  | SELECT OSCILLATOR PRIMARY/REDUNDANT  | OSC SLC  | DIG B      | 1/16     | 0B48      | 10 01       | 4T02-43  | 2C11-34  | 5710-34  |
| 9035                  | SERIAL DATA TRANSFER YES/NO          | SER DATA | DIG B      | 1/16     | 0B54      | 08 02       | 4T08-43  | 2C11-35  | 5710-35  |
| 9036                  | SERIAL DATA ERROR YES/NO             | DATA ERR | DIG B      | 1/16     | 0B51      | 08 03       | 4T06-62  | 2C11-18  | 5710-36  |
| 9037                  | 1 HZ (A) YES/NO                      | 1HZ (A)  | DIG B      | 1/16     | 1B59      | 01 03       | 4T04-61  | 2C13-19  | 5710-37  |
| 9038                  | 1 HZ (B) YES/NO                      | 1HZ (B)  | DIG B      | 1/16     | 3B51      | 18 01       | 4T04-24  | 2C13-07  | 5710-38  |
| 9039                  | PRIMARY Y CHAN. INPUT(ENABLE) YES/NO | PRI Y IN | DIG B      | 5/1      | 0B32      | 14 00       | 4T02-32  | 2C13-20  | 5710-39  |
| 9040                  | REDUN. Y CHAN. INPUT(ENABLE) YES/NO  | RED Y IN | DIG B      | 5/1      | 0B32      | 14 00       | 4T02-56  | 2C13-21  | 5710-40  |
| 9041                  | COMMAND EXECUTE COUNTER BIT 1        | CMD EX 1 | DIG B      | 1/1      | 1B33      | 16 02       | 4T02-41  | 2C11-12  | 5710-41  |

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| FUNC NO. | TLM FUNCTION                       | ACRONYM  | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CUNN | S/S CCA | INT CONN |
|----------|------------------------------------|----------|------------|----------|-----------|-------------|----------|---------|----------|
| 8042     | COMMAND EXECUTE COUNTER BIT 2      | CMD EX 2 | DIG B      | 1/1      | 2833      | 16 02       | 4T02-02  | 2C11-26 | 5710-42  |
| 8043     | COMMAND EXECUTE COUNTER BIT 4      | CMD EX 4 | DIG B      | 1/1      | 3833      | 16 02       | 4T02-66  | 2C11-27 | 5710-43  |
| 8044     | COMMAND EXECUTE COUNTER BIT 8      | CMD EX 8 | DIG B      | 1/1      | 4833      | 16 02       | 4T02-59  | 2C11-13 | 5710-44  |
| 8045     | COMMAND EXECUTE COUNTER BIT 16     | CMD EX16 | DIG B      | 1/1      | 5833      | 16 02       | 4T02-28  | 2C11-14 | 5710-45  |
| 8046     | COMMAND EXECUTE COUNTER BIT 32     | CMD EX32 | DIG B      | 1/1      | 6833      | 16 02       | 4T02-47  | 2C11-29 | 5710-46  |
| 8047     | PRIMARY COMSTOR FILL YES/NO        | PCOMSTFF | DIG B      | 1/1      | 1834      | 17 02       | 4T04-60  | 2C11-24 | 5710-47  |
| 8048     | REDUNDANT COMSTOR FILL YES/NO      | RCOMSTFF | DIG B      | 1/1      | 1837      | 16 04       | 4T06-41  | 2C11-22 | 5710-48  |
| 8049     | PRIMARY COMSTOR ACTIVATE YES/NO    | PCOMSTPA | DIG B      | 1/1      | 0837      | 16 04       | 4T06-39  | 2C11-10 | 5710-49  |
| 8050     | REDUNDANT COMSTOR ACTIVATE YES/NO  | RCOMSTPA | DIG B      | 1/1      | 2836      | 17 03       | 4T06-82  | 2C11-23 | 5710-50  |
| 8051     | PRIMARY COMSTOR VERIFY YES/NO      | PCOMSTV  | DIG B      | 1/1      | 1835      | 16 03       | 4T04-41  | 2C11-28 | 5710-51  |
| 8052     | REDUNDANT COMSTOR VERIFY YES/NO    | RCOMSTV  | DIG B      | 1/1      | 2834      | 17 02       | 4T04-82  | 2C11-11 | 5710-52  |
| 8053     | PRIMARY COMDEC IN-SYNC YES/NO      | PCD SYNC | DIG B      | 1/1      | 1836      | 17 03       | 4T06-60  | 2C11-01 | 5710-53  |
| 8054     | REDUNDANT COMDEC IN-SYNC YES/NO    | RCD SYNC | DIG B      | 1/1      | 2835      | 16 03       | 4T04-02  | 2C11-03 | 5710-54  |
| 8055     | PRIMARY COMDEC DATA ERROR YES/NO   | PCD ERR  | DIG B      | 5/1      | 0832      | 14 00       | 4T02-84  | 2C11-20 | 5710-55  |
| 8056     | REDUNDANT COMDEC DATA ERROR YES/NO | RCD ERR  | DIG B      | 5/1      | 3832      | 14 00       | 4T02-09  | 2C11-37 | 5710-56  |

NOTE SEE ELEC. INTERFACE S/S

COMMAND INTEGRATOR UNIT

|      |                         |          |       |      |      |       |         |         |  |
|------|-------------------------|----------|-------|------|------|-------|---------|---------|--|
| 9101 | -12V MONITOR A          | CIUA-12V | ALOG  | 1/16 | A244 | 10 29 | 4T04-77 | 2C48-05 |  |
| 9102 | -12V MONITOR B          | CIUB-12V | ALOG  | 1/16 | A403 | 09 52 | 4T90-47 | 2C50-05 |  |
| 9103 | -5V MONITOR A           | CIUA-5V  | ALOG  | 1/16 | A562 | 18 74 | 4T94-00 | 2C48-06 |  |
| 9104 | -5V MONITOR B           | CIUB-5V  | ALOG  | 1/16 | A467 | 18 61 | 4T92-47 | 2C50-06 |  |
| 9105 | TEMPERATURE A           | CIU A T  | ALOG  | 1/16 | A305 | 09 38 | 4T06-08 | 2C48-07 |  |
| 9106 | TEMPERATURE B           | CIU B T  | ALOG  | 1/16 | A588 | 12 78 | 4T96-76 | 2C50-07 |  |
| 9107 | CHANNEL A ON/OFF        | CHANNL A | DIG B | 1/16 | 1840 | 08 00 | 4T02-37 | 2C48-01 |  |
| 9108 | CHANNEL B ON/OFF        | CHANNL B | DIG B | 1/16 | 3856 | 12 02 | 4T02-06 | 2C50-01 |  |
| 9109 | COMMAND INPUT A CLK/CIU | CMD IN A | DIG B | 5/1  | 2832 | 14 00 | 4T02-82 | 2C48-02 |  |
| 9110 | COMMAND INPUT B CLK/CIU | CMD IN B | DIG B | 1/1  | 3835 | 16 03 | 4T04-66 | 2C50-02 |  |
| 9111 | MSFN ENABLE A YES/NO    | MSF A EN | DIG B | 1/1  | 3836 | 17 03 | 4T06-09 | 2C48-03 |  |
| 9112 | MSFN ENABLE B YES/NO    | MSF B EN | DIG B | 1/1  | 2837 | 16 04 | 4T06-02 | 2C50-03 |  |

VHF COMMAND RECEIVER

|      |                          |          |      |      |      |       |         |         |  |
|------|--------------------------|----------|------|------|------|-------|---------|---------|--|
| 8201 | TEMPERATURE RF/IF A      | RF A T   | ALOG | 1/16 | A330 | 15 41 | 4T08-45 | 2C06-35 |  |
| 8202 | TEMPERATURE RF/IF B      | RF B T   | ALOG | 1/16 | A112 | 12 10 | 4T08-09 | 2C06-37 |  |
| 8203 | TEMPERATURE DEMOD A      | DMOD A T | ALOG | 1/16 | A561 | 15 74 | 4T94-08 | 2C06-02 |  |
| 8204 | TEMPERATURE DEMOD B      | DMOD B T | ALOG | 1/16 | A176 | 15 19 | 4T82-09 | 2C06-05 |  |
| 8205 | AGC RECEIVER A           | RCVA AGC | ALOG | 1/1  | A598 | 04 00 | 4T96-13 | 2C06-07 |  |
| 8206 | AGC RECEIVER B           | RCVB AGC | ALOG | 1/1  | A599 | 05 00 | 4T96-46 | 2C06-09 |  |
| 8207 | AUDIO AMPLIFIER A OUTPUT | AMPA OUT | ALOG | 1/16 | A243 | 08 29 | 4T04-80 | 2C06-11 |  |
| 8208 | AUDIO AMPLIFIER B OUTPUT | AMPB OUT | ALOG | 1/16 | A304 | 01 38 | 4T06-09 | 2C06-13 |  |
| 8209 | FSK DEMODULATOR A OUTPUT | FSKA OUT | ALOG | 1/16 | A368 | 02 47 | 4T08-09 | 2C06-15 |  |

| FUNC NO. | TLM FUNCTION                  | ACRONYM   | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CUNN | S/E CCNN | INT CCNN |
|----------|-------------------------------|-----------|------------|----------|-----------|-------------|----------|----------|----------|
| 8210     | FSK DEMODULATOR B OUTPUT      | FSKB OUT  | ALOG       | 1/16     | A496      | 10 65       | 4T92-09  | 2C06-17  |          |
| 8211     | AM DEMODULATOR A OUTPUT       | AM A OUT  | ALOG       | 1/16     | A432      | 08 56       | 4T90-09  | 2C06-19  |          |
| 8212     | AM DEMODULATOR B OUTPUT       | AM B OUT  | ALOG       | 1/16     | A560      | 12 74       | 4T94-09  | 2C06-21  |          |
| 8213     | SUBCARRIER LEVEL DET A OUTPUT | DETA OUT  | ALOG       | 1/1      | A601      | 11 04       | 4T96-24  | 2C06-23  | Fm 10.11 |
| 8214     | SUBCARRIER LEVEL DET B OUTPUT | DETB OUT  | ALOG       | 1/1      | A602      | 13 03       | 4T96-43  | 2C06-25  | Fm 10.11 |
| 8215     | +15.7V DEMOD POWER A          | DMDB-15V  | ALOG       | 1/16     | A533      | 15 70       | 4T94-51  | 2C06-27  |          |
| 8216     | +15.7V DEMOD POWER B          | DMDB-15V  | ALOG       | 1/16     | A596      | 15 79       | 4T96-71  | 2C06-29  |          |
| 8217     | -10 REF VOLTS A               | REGA-10V  | ALOG       | 1/16     | A071      | 15 04       | 4T80-28  | 2C06-31  |          |
| 8218     | -10 REF VOLTS B               | REGB-10V  | ALOG       | 1/16     | A434      | 15 13       | 4T82-25  | 2C06-33  |          |
| 8219     | REC/DEMOP POWER A/B           | R/D SLCT  | DIG B      | 1/16     | 8843      | 15 00       | 4T04-42  | 2C06-04  |          |
| 8220     | REC/DEMOP POWER R/A           | SLCT R/D  | DIG B      | 1/16     | 8852      | 01 02       | 4T06-50  | 2C06-06  |          |
| ECAM     |                               |           |            |          |           |             |          |          |          |
| 8301     | ECAM ON/OFF                   | ECAM      | DIG B      | 1/16     | 0851      | 18 01       | 4T04-38  | 1C05-2   |          |
| 8302     | ECAM OUTPUT ENA/DIS           | ECAM OUT  | DIG B      | 1/16     | 6061      | 08 03       | 4T06-72  | 1C05-1   |          |
| 8303     | ECAM INHIBIT YES/NO           | ECAM INH  | DIG B      | 5/1      | 5832      | 14 00       | 4T04-74  | 1C05-6   |          |
| 8304     | ECAM EXECUTE/LOAD             | ECAM EXEC | DIG B      | 1/1      | 9833      | 16 02       | 4T02-16  | 1C05-4   |          |
| 8305     | ECAM RUN A/B                  | ECAM RUN  | DIG B      | 1/1      | 7835      | 14 03       | 4T04-76  | 1C05-5   |          |
| 8306     | ECAM PROGRAM/COMMAND          | ECAM PGM  | DIG B      | 1/1      | 3834      | 17 02       | 4T04-9   | 1C05-3   |          |
| 8311     | ECAM MEMORY TEMPERATURE       | MEMORY T  | ANAL       | 1/16     | A150      | 01 16       | 4T82-13  | 1C05-8   |          |
| 8312     | ECAM POWER SUPPLY TEMP.       | PWR SP T  | ANAL       | 1/16     | A315      | 12 39       | 4T86-78  | 1C05-7   |          |
| 17010    | ECAM VERIFY SLOW              | ECAM VFY  | DIG A      | 1/1      | DA04      | 11 04       | 4T30-29  | 1C11-7   |          |
| 17011    | ECAM VERIFY SLOW              | ECAM VFY  | DIG A      | 1/1      | DA04      | 13 04       | 4T30-29  | 1C11-7   |          |
| 17012    | ECAM VERIFY FAST              | ECAM VFY  | DIG A      | 5/1      | DA04      | 11 00       | 4T30-29  | 1C11-7   |          |
| 17013    | ECAM VERIFY FAST              | ECAM VFY  | DIG A      | 5/1      | DA04      | 13 00       | 4T30-29  | 1C11-7   |          |

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| FJNC NO.                  | TLM FUNCTION                               | ACRONYM  | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CCNN | INT CCNN |
|---------------------------|--|----------|------------|----------|-----------|-------------|----------|----------|----------|
| TELEMETRY PROCESSOR (TMP) |  |          |            |          |           |             |          |          |          |
| 9001                      | MEMORY SEQUENCER DC/DC CONVERTER A VOLTAGE | MSEQ A V | ALOG       | 1/16     | A111      | 10 10       | 4T80-18  | P4T56-2  |          |
| 9002                      | MEMORY SEQUENCER DC/DC CONVERTER B VOLTAGE | MSEQ B V | ALOG       | 1/16     | A558      | 08 74       | 4T94-33  | P4T56-3  |          |
| 9003                      | MEMORY SEQUENCER MODULE TEMPERATURE        | MEMSEQ T | ALOG       | 1/16     | A242      | 02 29       | 4T84-06  | P4T56-6  |          |
| 9004                      | FORMATTER DC/DC CONVERTER A VOLTAGE        | FMTR A V | ALOG       | 1/16     | A175      | 12 12       | 4T82-18  | P4T20-1  |          |
| 9005                      | FORMATTER DC/DC CONVERTER B VOLTAGE        | FMTR B V | ALOG       | 1/16     | A494      | 02 65       | 4T92-33  | P4T20-6  |          |
| 9006                      | DIG MUX DC/DC CONVERTER A VOLTAGE          | DMUX A V | ALOG       | 1/16     | A241      | 01 29       | 4T84-06  | P4T20-7  |          |
| 9007                      | DIG MUX DC/DC CONVERTER B VOLTAGE          | DMUX B V | ALOG       | 1/16     | A438      | 01 56       | 4T90-33  | P4T20-18 |          |
| 9008                      | FORMATTER/DIGITAL MUX MODULE TEMP          | F/DMUX T | ALOG       | 1/16     | A240      | 18 28       | 4T84-09  | P4T20-37 |          |
| 9009                      | ANALOG MUX DC/DC CONVERTER A VOLTAGE       | AMUX A V | ALOG       | 1/16     | A303      | 18 37       | 4T86-18  | P4T74-4  |          |
| 9010                      | ANALOG MUX DC/DC CONVERTER B VOLTAGE       | AMUX B V | ALOG       | 1/16     | A366      | 18 46       | 4T88-33  | P4T74-5  |          |
| 9011                      | A/D CONVERTER DC/DC CONVERTER A VOLTAGE    | CONV A V | ALOG       | 1/16     | A367      | 01 47       | 4T88-18  | P4T74-14 |          |
| 9012                      | A/D CONVERTER DC/DC CONVERTER B VOLTAGE    | CONV B V | ALOG       | 1/16     | A302      | 15 37       | 4T86-33  | P4T74-15 |          |
| 9013                      | ANALOG MUX A/D CONVERTER MODULE TEMP       | AMUX T   | ALOG       | 1/16     | A512      | 15 67       | 4T94-10  | P4T74-6  |          |
| 9014                      | PREREGULATOR A VOLTAGE                     | PRFG A V | ALOG       | 1/16     | A431      | 02 56       | 4T90-18  | P4T40-3  |          |
| 9015                      | PREREGULATOR B VOLTAGE                     | PRFG B V | ALOG       | 1/16     | A239      | 15 28       | 4T84-18  | P4T40-4  |          |
| 9016                      | REPROGRAMMER MODULE TEMP                   | REPROG T | ALOG       | 1/16     | A448      | 12 58       | 4T92-10  | P4T40-5  |          |
| 9017                      | MEMORY A DC/DC CONVERTER VOLTAGE           | MEM A V  | ALOG       | 1/16     | A495      | 08 65       | 4T92-18  | P1T08-13 |          |
| 9018                      | MEMORY A MODULE TEMPERATURE                | MEM A T  | ALOG       | 1/16     | A559      | 10 74       | 4T94-18  | P1T08-11 |          |
| 9019                      | MEMORY B DC/DC CONVERTER VOLTAGE           | MEM B V  | ALOG       | 1/16     | A174      | 12 12       | 4T82-33  | P4T56-18 |          |
| 9020                      | MEMORY B MODULE TEMPERATURE                | MEM B T  | ALOG       | 1/16     | A110      | 08 10       | 4T80-33  | P4T56-11 |          |
| 9021                      | POWER 1 OFF/ON                             | POWER 1  | DIG B      | 1/16     | 1844      | 18 00       | 4T06-37  | P4T40-1  |          |
| 9022                      | POWER 2 OFF/ON                             | POWER 2  | DIG B      | 1/16     | 1863      | 12 03       | 4T08-54  | P4T40-2  |          |
| 9023                      | MEMORY WRITE DELAY ON/OFF                  | MEM RITE | DIG B      | 1/16     | 1847      | 08 01       | 4T08-42  | P4T40-14 |          |
| 9025                      | MEMORY (A/B)                               | MEMORY   | DIG B      | 1/16     | 1849      | 12 01       | 4T02-67  | P4T40-06 |          |
| 9026                      | MEMORY SEQUENCER (A/B)                     | MEM SEQ  | DIG B      | 1/16     | 1950      | 15 01       | 4T04-26  | P4T40-10 |          |
| 9029                      | A/D CONVERTER STATUS (A/B)                 | A/D CONV | DIG B      | 1/16     | 1851      | 18 01       | 4T04-67  | P4T40-7  |          |
| 9030                      | ANALOG MUX (A/B)                           | ANAL MUX | DIG B      | 1/16     | 0855      | 10 02       | 4T08-38  | P4T40-11 |          |
| 9031                      | DIGITAL MUX (A/B)                          | DIG MUX  | DIG B      | 1/16     | 0856      | 12 02       | 4T02-23  | P4T40-8  |          |
| 9032                      | FORMATTER LOGIC STATUS A/R                 | FORMATTR | DIG B      | 1/16     | 0857      | 15 02       | 4T02-62  | P4T40-13 |          |
| 9033                      | KMTR RUF AMP STATUS A/B                    | RUFF AMP | DIG B      | 1/16     | 1853      | 02 02       | 4T06-67  | P4T40-15 |          |
| VHF TRANSMITTER           |  |          |            |          |           |             |          |          |          |
| 9100                      | REFLECTED POWER                            | REFL PWR | ALOG       | 1/16     | A189      | 02 10       | 4T80-53  | 3T03-03  | 5714-n1  |
| 9101                      | TRANSMITTER A -20 VDC OUTPUT               | XMTA-20V | ALOG       | 1/16     | A173      | 08 19       | 4T82-53  | 3T03-23  | 5714-n2  |
| 9102                      | TRANSMITTER B -20 VDC OUTPUT               | XMTB-20V | ALOG       | 1/16     | A238      | 12 28       | 4T84-33  | 3T03-09  | 5714-n3  |
| 9103                      | TRANSMITTER A TEMPERATURE                  | XMTA T   | ALOG       | 1/16     | A301      | 12 37       | 4T86-53  | 3T03-01  | 5714-n4  |
| 9104                      | TRANSMITTER B TEMPERATURE                  | XMTB T   | ALOG       | 1/16     | A365      | 15 46       | 4T88-53  | 3T03-14  | 5714-n5  |
| 9105                      | KMTR A, RF POWER OUTPUT                    | A RF PWR | ALOG       | 1/16     | A340      | 02 43       | 4T88-71  | 3T03-16  | 5714-n6  |

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| C-28<br>FUNC<br>NO.            | TLM FUNCTION                               | ACRONYM              | SIGNAL<br>TYPE | SAMP<br>SEC  | GATE<br>ADDR | COLUMN<br>/ROW | VIP<br>CONN        | S/S<br>CCAN       | INT<br>CCAN        |  |
|--------------------------------|--|----------------------|----------------|--------------|--------------|----------------|--------------------|-------------------|--------------------|--|
|                                |  |                      |                |              |              |                |                    |                   |                    |  |
| 910A                           | XMTR B, RF POWER OUTPUT                    | R RF PWR             | ALOG           | 1/16         | A429         | 18 55          | 4T90-53            | 3T03-18           | 5714-07            |  |
| 9109                           | POWER MODE A HIGH/LOW                      | PWR MD A             | DIG B          | 1/16         | 1864         | 08 03          | 4T06-61            | 3T03-12           | 5714-10            |  |
| 9110                           | STORED DATA INPUT NBIT1/NBIT2              | STRD IN              | DIG B          | 1/16         | 9862         | 10 03          | 4T08-73            | 3T03-05           | 5714-11            |  |
| 9111                           | DATA INPUT REALTIME/STORED                 | DATA IN              | DIG B          | 1/16         | 1856         | 12 02          | 4T02-21            | 3T03-10           | 5714-12            |  |
| 9112                           | POWER MODE P HIGH/LOW                      | PWR MD B             | DIG B          | 1/16         | 7851         | 18 01          | 4T04-71            | 3T03-11           | 5714-13            |  |
| NARROWBAND TAPE RECORDER NO. 1 |  |                      |                |              |              |                |                    |                   |                    |  |
| 10001                          | MOTOR CURRENT 1                            | MOTR I 1             | ALOG           | 1/16         | A428         | 15 55          | 4T90-15            | 5A03-FF           | 5709-04            |  |
| 10002                          | POWER SUPPLY CURRENT 1                     | PS CUR 1             | ALOG           | 1/16         | A493         | 01 65          | 4T92-53            | 5A03-JJ           | 5709-03            |  |
| 10003                          | RECORDER TEMPERATURE 1                     | RCNR T 1             | ALOG           | 1/16         | A557         | 02 74          | 4T94-53            | 5A03-M            | 5709-02            |  |
| 10004                          | POWER SUPPLY VOLTAGE 1                     | PS VLT 1             | ALOG           | 1/16         | A108         | 01 10          | 4T00-15            | 5A03-L            | 5709-01            |  |
| 10005                          | RECORD MODE 1 ON/OFF                       | RECORD 1             | DIG B          | 1/16         | 3838         | 01 00          | 4T08-09            | 5A03-P            | 5709-13            |  |
| 10006                          | PLAYBACK MODE 1 ON/OFF                     | PLAYBK 1             | DIG B          | 1/16         | 3839         | 02 00          | 4T08-66            | 5A03-FF           | 5709-14            |  |
| 10007                          | RECORD END OF TAPE PRIMARY 1 YES/NO        | REOT P 1             | DIG B          | 1/16         | 3840         | 08 00          | 4T02-58            | 5A03-R            | 5709-15            |  |
| 10008                          | RECORD END OF TAPE<br>SECONDARY 1 YES/NO   | REOT S 1             | DIG B          | 1/16         | 3841         | 10 00          | 4T02-44            | 5A03-S            | 5709-16            |  |
| 10009                          | PLAYBACK END OF TAPE<br>PRIMARY 1 YES/NO   | PEOT P 1             | DIG B          | 1/16         | 3842         | 12 00          | 4T04-58            | 5A03-T            | 5709-17            |  |
| 10010                          | PLAYBACK END OF TAPE<br>SECONDARY 1 YES/NO | PEOT S 1             | DIG B          | 1/16         | 3843         | 15 00          | 4T04-44            | 5A03-V            | 5709-18            |  |
| 10011                          | RECORDER PRESSURE 1 LOW/NOR                | RCNR P 1             | DIG B          | 1/16         | 8363         | 12 03          | 4T08-12            | 5A03-N            | 5709-12            |  |
| NARROWBAND TAPE RECORDER NO. 2 |  |                      |                |              |              |                |                    |                   |                    |  |
| 10101                          | MOTOR CURRENT 2                            | MOTR I 2             | ALOG           | 1/16         | A172         | 02 19          | 4T82-15            | 5A04-FF           | 5709-23            |  |
| 10102                          | POWER SUPPLY CURRENT 2                     | PS CUR 2             | ALOG           | 1/16         | A237         | 10 28          | 4T84-53            | 5A04-JJ           | 5709-22            |  |
| 10103                          | RECORDER TEMPERATURE 2                     | RCNR T 2             | ALOG           | 1/16         | A300         | 10 37          | 4T86-15            | 5A04-M            | 5709-21            |  |
| 10104                          | POWER SUPPLY VOLTAGE 2                     | PS VLT 2             | ALOG           | 1/16         | A364         | 12 46          | 4T88-15            | 5A04-L            | 5709-20            |  |
| 10105                          | RECORD MODE 2 ON/OFF                       | RECORD 2             | DIG B          | 1/16         | 3844         | 18 00          | 4T06-58            | 5A04-P            | 5709-12            |  |
| 10106                          | PLAYBACK MODE 2 ON/OFF<br>PRIMARY 2 YES/NO | PLAYBK 2<br>REOT P 2 | DIG B<br>DIG B | 1/16<br>1/16 | 3845<br>3846 | 01 01<br>02 01 | 4T06-44<br>4T08-58 | 5A04-FF<br>5A04-R | 5709-13<br>5709-14 |  |
| 10108                          | RECORD END OF TAPE<br>SECONDARY 2 YES/NO   | REOT S 2             | DIG B          | 1/16         | 3847         | 08 01          | 4T08-44            | 5A04-S            | 5709-35            |  |
| 10109                          | PLAYBACK END OF TAPE<br>PRIMARY 2 YES/NO   | PEOT P 2             | DIG B          | 1/16         | 3848         | 10 01          | 4T02-17            | 5A04-T            | 5709-16            |  |
| 10110                          | PLAYBACK END OF TAPE<br>SECONDARY 2 YES/NO | PEOT S 2             | DIG B          | 1/16         | 3849         | 12 01          | 4T02-24            | 5A04-V            | 5709-17            |  |
| 10111                          | RECORDER PRESSURE 2 LOW/NOR                | RCNR P 2             | DIG B          | 1/16         | 1857         | 15 02          | 4T02-61            | 5A04-N            | 5709-11            |  |
| UNIFIED S-BAND EQUIPMENT (USB) |  |                      |                |              |              |                |                    |                   |                    |  |
| 11001                          | RECEIVER AGC VOLTAGE                       | RCVR AGC             | ALOG           | 1/16         | A427         | 12 55          | 4T90-36            | 3U31-M            | 5714-17            |  |
| 11002                          | XMTR OUTPUT POWER LEVEL                    | XMTR PWR             | ALOG           | 1/16         | A492         | 18 64          | 4T92-15            | 3U31-T            | 5714-18            |  |
| 11003                          | RECEIVER STATIC PHASE ERROR                | RCVR ERR             | ALOG           | 1/16         | A556         | 04 74          | 4T94-15            | 3U31-N            | 5714-19            |  |
| 11004                          | TRANSPONDER TEMPERATURE                    | TRSPDR T             | ALOG           | 1/16         | A107         | 18 09          | 4T80-36            | 3U31-P            | 5714-20            |  |

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MOORE BUSINESS FORMS, INC., MO

SPEEDIFAX

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| FUNC NO.                       | TLN FUNCTION                      | ACRONYM  | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CCA | INT CONN |
|--------------------------------|-----------------------------------|----------|------------|----------|-----------|-------------|----------|---------|----------|
| 11005                          | TRANSPONDER PRESSURE              | TRSPDR P | ALOG       | 1/16     | A171      | 01 19       | 4T82-36  | 3U31-U  | 5714-21  |
| 11006                          | RECEIVER A/R                      | RECEIVER | DIG B      | 1/16     | 3850      | 15 01       | 4T04-17  | 3U29-M  | 5714-22  |
| 11007                          | XMTA ON/OFF -15V                  | XMTA-15V | ALOG       | 1/16     | A078      | 15 05       | 4T80-48  | 3U29-T  | 5717-40  |
| 11008                          | XMTB ON/OFF -15V                  | XMTB-15V | ALOG       | 1/16     | A141      | 15 14       | 4T82-73  | 3U29R-U | 5717-42  |
| 11009                          | RANGING MODE ON/OFF -15V          | RNG -15V | ALOG       | 1/16     | A204      | 15 23       | 4T84-76  | 3U29-N  | 5717-19  |
| 11010                          | AUX OSCILLATOR BYPASS/ENABLED     | AUX OSC  | DIG B      | 1/16     | 3853      | 02 02       | 4T06-24  | 3U29-S  | 5714-06  |
| 11011                          | MODULATION INPUT NORMAL/CROSSED   | MOD IN   | DIG B      | 1/16     | 3854      | 08 02       | 4T08-17  | 3U29-R  | 5714-27  |
| PREMODULATOR PROCESSOR (PMP)   |                                   |          |            |          |           |             |          |         |          |
| 11102                          | POWER SUPPLY P VOLTAGE            | PWP B V  | ALOG       | 1/16     | A299      | 08 37       | 4T84-15  | 3U05-L  | 5714-34  |
| 11103                          | TEMPERATURE A                     | TEMP A   | ALOG       | 1/16     | A363      | 10 45       | 4T86-36  | 3U05-M  | 5714-35  |
| 11104                          | TEMPERATURE B                     | TEMP B   | ALOG       | 1/16     | A426      | 10 55       | 4T90-81  | 3U05-A  | 5714-36  |
| 11105                          | DISCRIMINATOR A ON/OFF            | DISCR A  | DIG B      | 1/16     | 3857      | 15 02       | 4T02-07  | 3U05-B  | 5714-37  |
| 11106                          | DISCRIMINATOR B ON/OFF            | DISCR B  | DIG B      | 1/16     | 3858      | 18 02       | 4T04-06  | 3U05-H  | 5714-38  |
| 11107                          | MODULATOR A ON/OFF                | MODLTR A | DIG B      | 1/16     | 3859      | 01 03       | 4T04-07  | 3U05-J  | 5714-39  |
| 11108                          | MODULATOR B ON/OFF                | MODLTR B | DIG B      | 1/16     | 3860      | 02 03       | 4T06-06  | 3U05-P  | 5714-40  |
| 11109                          | WBTR 1/2                          | WBTR SLT | DIG B      | 1/16     | 3861      | 08 03       | 4T06-07  | 3U05-R9 | 5714-41  |
| 11110                          | WBTR 1/2                          | WBTR SL  | DIG B      | 1/16     | 3862      | 10 03       | 4T08-06  | 3U05-T  | 5714-42  |
| 11111                          | RECORDER IN NPTR/WBTR             | RCNR IN  | DIG B      | 1/16     | 0863      | 12 03       | 4T08-62  | 3U05-S  | 5714-43  |
| 11111                          | RECORDER IN NPTR/WBTR             | RCNR IN  | DIG B      | 1/16     | 0863      | 12 03       | 4T08-62  | 3U05-U  | 5714-44  |
| WIDEBAND POWER AMPLIFIER NO. 1 |                                   |          |            |          |           |             |          |         |          |
| 12001                          | COLLECTOR TEMP 1                  | CLTR T 1 | ALOG       | 1/16     | A343      | 12 43       | 4T88-46  | 1W17-J  | 5712-40  |
| 12002                          | HELIX CURRENT 1                   | HELX I 1 | ALOG       | 1/16     | A407      | 15 52       | 4T90-40  | 1W17-D  | 5712-41  |
| 12003                          | CATHODE CURRENT 1                 | CATH I 1 | ALOG       | 1/16     | A471      | 18 61       | 4T92-44  | 1W17-C  | 5712-42  |
| 12004                          | FORWARD POWER 1                   | FWD PW 1 | ALOG       | 1/16     | A536      | 02 71       | 4T94-41  | 1W17-A  | 5712-43  |
| 12005                          | REFLECTED POWER 1                 | RFL PW 1 | ALOG       | 1/16     | A576      | 18 76       | 4T96-10  | 1W17-B  | 5712-44  |
| 12006                          | HEATER STATUS 1 ON/OFF            | HTR ST 1 | DIG B      | 1/16     | 2854      | 08 02       | 4T08-34  | 1W23-A  | 5712-45  |
| 12008                          | POWER MODE 1 HIGH/LOW             | PWR MD 1 | DIG B      | 1/16     | 2856      | 12 02       | 4T02-08  | 1W23-J  | 5712-47  |
| WIDEBAND POWER AMPLIFIER NO. 2 |                                   |          |            |          |           |             |          |         |          |
| 12101                          | COLLECTOR TEMP 2                  | CLTR T 2 | ALOG       | 1/16     | A342      | 10 43       | 4T88-13  | 1W29-D  | 5712-48  |
| 12102                          | HELIX CURRENT 2                   | HELX I 2 | ALOG       | 1/16     | A406      | 12 52       | 4T90-13  | 1W29-J  | 5712-49  |
| 12103                          | CATHODE CURRENT 2                 | CATH I 2 | ALOG       | 1/16     | A470      | 15 61       | 4T92-13  | 1W29-C  | 5712-50  |
| 12104                          | FORWARD POWER 2                   | FWD PW 2 | ALOG       | 1/16     | A535      | 01 71       | 4T94-46  | 1W29-A  | 5712-51  |
| 12105                          | REFLECTED POWER 2                 | RFL PW 2 | ALOG       | 1/16     | A597      | 18 79       | 4T96-51  | 1W29-B  | 5712-52  |
| 12106                          | HEATER STATUS 2 ON/OFF            | HTR ST 2 | DIG B      | 1/16     | 2858      | 18 02       | 4T04-08  | 1W35-A  | 5712-53  |
| 12108                          | POWER MODE 2 HI/LOW               | PWR MD 2 | DIG B      | 1/16     | 2860      | 02 03       | 4T06-08  | 1W35-J  | 5712-55  |
| WIDEBAND FREQUENCY MODULATOR   |                                   |          |            |          |           |             |          |         |          |
| 12200                          | RBV FILTER A                      | RBV FL A | DIG B      | 1/16     | 9854      | 08 02       | 4T08-33  | 1W46-10 |          |
| 12201                          | RBV FILTER B                      | RBV FL B | DIG B      | 1/16     | 9855      | 10 02       | 4T08-30  | 1W46-20 |          |
| 12202                          | AUX. DATA TO RBV FILT. A YES/NO   | AX TO RA | DIG B      | 1/16     | 9839      | 02 00       | 4T08-16  | 1W46-01 |          |
| 12203                          | AUX. DATA TO RBV FILT. B YES/NO   | AX TO RB | DIG B      | 1/16     | 9840      | 08 00       | 4T02-49  | 1W46-21 |          |
| 12204                          | RT DATA TO RBV FILT. A YES/NO     | RT TO RA | DIG B      | 1/16     | 9841      | 10 00       | 4T02-42  | 1W46-02 |          |
| 12205                          | RT DATA TO RBV FILT. B YES/NO     | RT TO RB | DIG B      | 1/16     | 9842      | 12 00       | 4T04-49  | 1W46-22 |          |
| 12206                          | TAPE 1 DATA TO RBV FILT. A YES/NO | T1 TO RA | DIG B      | 1/16     | 9843      | 15 00       | 4T04-79  | 1W46-03 |          |
| 12207                          | TAPE 1 DATA TO RBV FILT. B YES/NO | T1 TO RB | DIG B      | 1/16     | 9844      | 18 00       | 4T06-45  | 1W46-23 |          |
| 12208                          | TAPE 2 DATA TO RBV FILT. A YES/NO | T2 TO RA | DIG B      | 1/16     | 9845      | 01 01       | 4T06-79  | 1W46-04 |          |
| 12209                          | TAPE 2 DATA TO RBV FILT. B YES/NO | T2 TO RB | DIG B      | 1/16     | 9846      | 02 01       | 4T08-49  | 1W46-24 |          |

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| FUNC NO.           | TLN FUNCTION                | ACRONYM | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CCNN | INT CONN        |
|--------------------|-----------------------------|---------|------------|----------|-----------|-------------|----------|----------|-----------------|
| 12210              | MSS FILTER A                | OUT/IN  | MSS FL A   | DIG B    | 1/16      | 9856        | 12 02    | 4T02-73  | 1W46-30         |
| 12211              | MSS FILTER B                | OUT/IN  | MSS FL B   | DIG B    | 1/16      | 9857        | 15 02    | 4T02-54  | 1W46-11         |
| 12212              | RT DATA* TO MSS FILT. A     | YES/NO  | RT* M A    | DIG B    | 1/16      | 9847        | 08 01    | 4T08-11  | 1W46-25         |
| 12213              | RT DATA* TO MSS FILT. B     | YES/NO  | RT* M B    | DIG B    | 1/16      | 9848        | 10 01    | 4T02-33  | 1W46-06         |
| 12214              | RT DATA** TO MSS FILT. A    | YES/NO  | RT** M A   | DIG B    | 1/16      | 7863        | 12 03    | 4T08-45  | 1W46-26         |
| 12215              | RT DATA** TO MSS FILT. B    | YES/NO  | RT** M B   | DIG B    | 1/16      | 9852        | 01 02    | 4T06-34  | 1W46-07         |
| 12216              | TAPE 1 DATA TO MSS FILT. A  | YES/NO  | T1 TO MA   | DIG B    | 1/16      | 9849        | 12 01    | 4T02-05  | 1W46-27         |
| 12217              | TAPE 1 DATA TO MSS FILT. B  | YES/NO  | T1 TO MB   | DIG B    | 1/16      | 9850        | 15 01    | 4T04-35  | 1W46-08         |
| 12218              | TAPE 2 DATA TO MSS FILT. A  | YES/NO  | T2 TO MA   | DIG B    | 1/16      | 9851        | 18 01    | 4T04-05  | 1W46-28         |
| 12219              | TAPE 2 DATA TO MSS FILT. B  | YES/NO  | T2 TO MB   | DIG B    | 1/16      | 9855        | 10 02    | 4T08-05  | 1W46-09         |
| 12220              | MODULATOR A, VCO            | A1/A2   | MODA VCO   | DIG B    | 1/16      | 9860        | 02 03    | 4T06-73  | 1W46-05         |
| 12221              | MODULATOR B, VCO            | B1/B2   | MODB VCO   | DIG B    | 1/16      | 9861        | 08 03    | 4T06-54  | 1W46-20         |
| 12222              | MODULATOR A, AFC            | OUT/IN  | MODA AFC   | DIG B    | 1/16      | 9858        | 18 02    | 4T04-73  | 1W46-12         |
| 12223              | MODULATOR B, AFC            | OUT/IN  | MODB AFC   | DIG B    | 1/16      | 9859        | 01 03    | 4T04-54  | 1W46-31         |
| 12224              | DATA OUTPUT A NORMAL/SUMMED |         | DATA A     | DIG B    | 1/16      | 2838        | 01 00    | 4T08-82  | 1W46-17         |
| 12225              | DATA OUTPUT B NORMAL/SUMMED |         | DATA B     | DIG B    | 1/16      | 9841        | 10 00    | 4T02-79  | 1W46-35         |
| 12226              | RBV BIAS A/P                |         | RBV BIAS   | DIG B    | 1/16      | 9847        | 08 01    | 4T08-79  | 1W46-13         |
| 12227              | MODULATOR A, LOOP STRESS    |         | MODA L S   | ALOG     | 1/16      | A466        | 02 61    | 4T92-44  | 1W46-14         |
| 12228              | MODULATOR B, LOOP STRESS    |         | MODB L S   | ALOG     | 1/16      | A586        | 08 78    | 4T96-45  | 1W46-33         |
| 12229              | WBM TEMPERATURE             |         | WBM TEMP   | ALOG     | 1/16      | A338        | 18 42    | 4T88-44  | 1W46-15         |
| WBM POWER INVERTER |                             |         |            |          |           |             |          |          |                 |
| 12230              | WBM INVERTER A              | OFF/ON  | INVRTA     | DIG B    | 1/16      | 9838        | 01 00    | 4T08-56  | 1W11-07 5712-70 |
| 12231              | WBM INVERTER B              | OFF/ON  | INVRTB     | DIG B    | 1/16      | 2847        | 08 01    | 4T08-19  | 1W11-08 5712-71 |
| 12232              | 15 REG. VOLTAGE A           |         | 15V A      | ALOG     | 1/16      | A113        | 15 10    | 4T00-08  | 1W05-13 5712-72 |
| 12233              | 15 REG VOLTAGE B            |         | 15V B      | ALOG     | 1/16      | A213        | 01 25    | 4T04-51  | 1W05-14 5712-73 |
| 12234              | -15 REG VOLTAGE A           |         | -15V A     | ALOG     | 1/16      | A212        | 18 24    | 4T04-71  | 1W05-03 5712-74 |
| 12235              | -15 REG VOLTAGE B           |         | -15V B     | ALOG     | 1/16      | A339        | 01 43    | 4T08-47  | 1W05-04 5712-75 |
| 12236              | 5 REG VOLTAGE A             |         | 5V A       | ALOG     | 1/16      | A402        | 01 52    | 4T90-44  | 1W05-11 5712-76 |
| 12237              | 5 REG VOLTAGE B             |         | 5V B       | ALOG     | 1/16      | A404        | 08 52    | 4T90-71  | 1W05-12 5712-77 |
| 12238              | -5 REG VOLTAGE A            |         | -5V A      | ALOG     | 1/16      | A177        | 18 19    | 4T82-06  | 1W05-05 5712-78 |
| 12239              | -5 REG VOLTAGE B            |         | -5V B      | ALOG     | 1/16      | A468        | 10 61    | 4T92-71  | 1W05-06 5712-79 |
| 12240              | -24.5 MONITOR NO. 1 A/B     |         | -24.5 M1   | ALOG     | 1/16      | A211        | 15 24    | 4T04-47  | 1W05-01 5712-80 |
| 12241              | -24.5 MONITOR NO. 2 A/B     |         | -24.5 M2   | ALOG     | 1/16      | A590        | 18 78    | 4T96-48  | 1W05-02 5712-81 |
| 12242              | WBM INVERTER TEMP           |         | INVRTT     | ALOG     | 1/16      | A587        | 10 78    | 4T96-72  | 1W11-03 5712-82 |

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\* 13000,14000,15000,16000 \*  
\* PAYLOAD SYSTEM \*  
\* \*\*\*\*\*



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| FUNC NO.                        | TLN FUNCTION                        | ACRONYM   | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /POM | VIP CONN | S/S CCNA | IAT CCNN |
|---------------------------------|-------------------------------------|-----------|------------|----------|-----------|-------------|----------|----------|----------|
| WIDE BAND VIDEO TAPE RECORDER 1 |                                     |           |            |          |           |             |          |          |          |
| 13001                           | MSS STANDRY 1 YES/NO                | MSS SBY1  | DIG B      | 1/1      | 4B34      | 17 02       | 4T04-1   | 5W16-R   |          |
| 13002                           | RBV STANDRY 1 YES/NO                | RBV SBY1  | DIG B      | 1/1      | 4B35      | 16 03       | 4T04-59  | 5W16-R   |          |
| 13003                           | RECORD 1 YES/NO                     | WB RCD 1  | DIG B      | 1/1      | 4B36      | 17 03       | 4T06-1   | 5W16-H   |          |
| 13004                           | PLAYBACK 1 YES/NO                   | WB PRK 1  | DIG B      | 1/1      | 4B37      | 16 04       | 4T06-59  | 5W16-I   |          |
| 13005                           | FAST REWIND 1 YES/NO                | REWIND 1  | DIG B      | 1/16     | 2B62      | 10 03       | 4T08-8   | 5W16-J   |          |
| 13006                           | FAST FWD 1 YES/NO                   | FORWARD 1 | DIG B      | 1/16     | 2B63      | 12 03       | 4T08-22  | 5W16-S   |          |
| 13007                           | RBV ENABLE 1 YES/NO                 | RBV EN 1  | DIG B      | 1/1      | 6B34      | 17 02       | 4T04-32  | 5W16-F   |          |
| 13008                           | PRIMARY END OF TAPE 1 YES/NO        | P FOT 1   | DIG B      | 1/16     | 4B39      | 02 00       | 4T08-59  | 5W16-N   |          |
| 13009                           | SECONDARY END OF TAPE 1 YES/NO      | S FOT 1   | DIG B      | 1/16     | 4B40      | 08 00       | 4T02-83  | 5W16-M   |          |
| 13010                           | PRIMARY BEGIN OF TAPE 1 YES/NO      | P POT 1   | DIG B      | 1/16     | 4B41      | 17 00       | 4T02-18  | 5W16-E   |          |
| 13011                           | SECONDARY BEGIN OF TAPE 1 YES/NO    | S POT 1   | DIG B      | 1/16     | 4B42      | 12 00       | 4T04-83  | 5W16-P   |          |
| 13012                           | RBV RUN TAPE 1 YES/NO               | RBV TP 1  | DIG B      | 1/1      | 6B35      | 16 03       | 4T04-47  | 5W16-G   |          |
| 13013                           | LAP NO 1 YES/NO                     | LAP 1     | DIG B      | 1/16     | 4B43      | 15 00       | 4T04-18  | 5W16-R   |          |
| 13014                           | MSS/RBV STATUS NO 1 MSS/RBV         | STATUS 1  | DIG B      | 1/16     | 4B44      | 18 00       | 4T06-83  | 5W16-T   |          |
| 13015                           | CURRENT SET TO 4DR NO 1 IN/OUT      | 4DR SET1  | DIG B      | 1/16     | 4B45      | 01 01       | 4T06-18  | 5W16-U   |          |
| 13016                           | CURRENT SET TO 2 DR NO 1 IN/OUT     | 2DR SET1  | DIG B      | 1/16     | 4B46      | 02 01       | 4T08-83  | 5W16-V   |          |
| 13017                           | CURRENT SET TO 1 DR NO 1 IN/OUT     | 1DR SET1  | DIG B      | 1/16     | 4B47      | 08 01       | 4T08-18  | 5W16-W   |          |
| 13018                           | CONVERTER PRIMARY PWR 1 ON/OFF      | CNV PWR1  | DIG B      | 1/16     | 4B49      | 12 01       | 4T02-69  | 5W16-D   |          |
| 13019                           | VOLTAGE PROTECT 1 ENABLE/DISABLE    | VLT PRT1  | DIG B      | 1/16     | 4B50      | 15 01       | 4T04-3   | 5W16-T   |          |
| 13020                           | PRIMARY VOLTAGE RANGE NO 1 IN/OUT   | P V RNG1  | DIG B      | 1/16     | 4B51      | 18 01       | 4T04-69  | 5W16-P   |          |
| 13021                           | VOLTAGE PROTECT RELAY 1 OPEN/CLOSED | V PR RY1  | DIG B      | 1/16     | 4B52      | 01 02       | 4T06-3   | 5W16-S   |          |
| 13022                           | TU PRESSURE 1                       | TU PPS 1  | ALOG       | 1/16     | A065      | 18 03       | 4T08-23  | 5W16-A   |          |
| 13023                           | TU TEMPERATURE 1                    | TU TEMP1  | ALOG       | 1/16     | A129      | 01 13       | 4T82-23  | 5W16-R   |          |
| 13024                           | EU TEMPERATURE 1                    | EU TEMP1  | ALOG       | 1/16     | A194      | 08 22       | 4T04-25  | 5W16-C   |          |
| 13025                           | TAPE FOOTAGE 1                      | TAPE FT1  | ALOG       | 1/16     | A258      | 18 31       | 4T86-25  | 5W16-Z   |          |
| 13026                           | CAPSTAN MOTOR SPEED 1               | CPST MS1  | ALOG       | 1/16     | A321      | 18 40       | 4T08-23  | 5W16-B   |          |
| 13027                           | 4WP MOTOR SPEED 1                   | HWP MS 1  | ALOG       | 1/16     | A386      | 15 49       | 4T90-25  | 5W16-G   |          |
| 13028                           | CAPSTAN MOTOR CURRENT 1             | CPST MI1  | ALOG       | 1/16     | A450      | 18 58       | 4T92-25  | 5W16-J   |          |
| 13029                           | PLAYBACK VOLTAGE 1                  | P/R V 1   | ALOG       | 1/16     | A513      | 18 67       | 4T94-23  | 5W16-E   |          |
| 13030                           | 4WP MOTOR CURRENT NO 1              | HWP MI 1  | ALOG       | 1/16     | A595      | 12 79       | 4T96-47  | 5W16-M   |          |
| 13031                           | RECORDER INPUT CURRENT 1            | R IN I 1  | ALOG       | 1/1      | A629      | 07 04       | 4T96-32  | 5W16-C   |          |
| 13032                           | LIMITER VOLTAGE NO 1                | LMTR V 1  | ALOG       | 1/16     | A066      | 01 04       | 4T80-25  | 5W16-D   |          |
| 13033                           | SERVO VOLTAGE NO 1                  | SERV V 1  | ALOG       | 1/16     | A130      | 02 13       | 4T82-25  | 5W16-F   |          |
| 13034                           | CONVERTER OUTPUT 5.6V 1             | 5.6CNV1   | ALOG       | 1/16     | A400      | 15 51       | 4T90-04  | 5W16-K   |          |

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WIDE BAND VIDEO TAPE RECORDER NO 2

|       |                      |          |       |      |      |       |         |        |  |
|-------|----------------------|----------|-------|------|------|-------|---------|--------|--|
| 13101 | MSS STANDRY 2 YES/NO | MSS SBY2 | DIG B | 1/1  | 6B37 | 16 04 | 4T06-47 | 5W40-R |  |
| 13102 | RBV STANDRY 2 YES/NO | RBV SRY2 | DIG B | 1/1  | 8B35 | 16 03 | 4T04-31 | 5W40-R |  |
| 13103 | RECORD 2 YES/NO      | WB RCD 2 | DIG B | 1/1  | 8B36 | 17 03 | 4T06-51 | 5W40-H |  |
| 13104 | PLAYBACK 2 YES/NO    | WB PRK 2 | DIG B | 1/1  | 8B37 | 16 04 | 4T06-31 | 5W40-I |  |
| 13105 | FAST REWIND 2 YES/NO | REWIND 2 | DIG B | 1/16 | 4B53 | 02 02 | 4T06-69 | 5W40-J |  |

| FUNC NO. | TLM FUNCTION                        | ACRONYM          | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CCNN | INT CCNN |
|----------|-------------------------------------|------------------|------------|----------|-----------|-------------|----------|----------|----------|
| 13106    | FAST FORWARD 2 YES/NO               | FOWARD 2         | DIG B      | 1/16     | 4854      | 08 02       | 4T08-3   | 5W40-S   |          |
| 13107    | RBV ENABLE 2 YES/NO                 | RBV EN 2         | DIG B      | 1/1      | 9834      | 17 02       | 4T04-56  | 5W40-F   |          |
| 13108    | PRIMARY END OF TAPE 2 YES/NO        | P FOT 2          | DIG B      | 1/16     | 4855      | 10 02       | 4T08-69  | 5W40-N   |          |
| 13109    | SECONDARY END OF TAPE 2 YES/NO      | S FOT 2          | DIG B      | 1/16     | 4856      | 12 02       | 4T02-35  | 5W40-M   |          |
| 13110    | PRIMARY BEGIN OF TAPE 2 YES/NO      | P ROT 2          | DIG B      | 1/16     | 4857      | 15 02       | 4T02-36  | 5W40-F   |          |
| 13111    | SECONDARY BEGIN OF TAPE 2 YES/NO    | S ROT 2          | DIG B      | 1/16     | 4858      | 18 02       | 4T04-35  | 5W40-P   |          |
| 13112    | RBV RUN TAPE 2 YES/NO               | RBV TP 2         | DIG B      | 1/1      | 9835      | 16 03       | 4T04-16  | 5W40-G   |          |
| 13113    | LAP NO 2 YES/NO                     | LAP 2            | DIG B      | 1/16     | 4859      | 01 03       | 4T04-36  | 5W40-R   |          |
| 13114    | MSS/RBV STATUS 2                    | MSS/RBV STATUS 2 | DIG B      | 1/16     | 4860      | 02 03       | 4T06-35  | 5W40-T   |          |
| 13115    | CURRENT SET 4 DR 2 IN/OUT           | 4DR SET2         | DIG B      | 1/16     | 4861      | 08 03       | 4T06-36  | 5W40-U   |          |
| 13116    | CURRENT SET 2 DR 2 IN/OUT           | 2DR SET2         | DIG B      | 1/16     | 4862      | 10 03       | 4T08-35  | 5W40-V   |          |
| 13117    | CURRENT SET 1 DR 2 IN/OUT           | 1DR SET2         | DIG B      | 1/16     | 4863      | 12 03       | 4T08-36  | 5W40-W   |          |
| 13118    | CONVERTER PRIMARY PWR 2 ON/OFF      | CNV PWR2         | DIG B      | 1/16     | 6838      | 01 00       | 4T08-32  | 5W40-D   |          |
| 13119    | VOLTAGE PROTECT 2 EN/DIS            | VLT PRT2         | DIG B      | 1/16     | 6839      | 02 00       | 4T08-47  | 5W40-T   |          |
| 13120    | PRIMARY VOLT. RANGE NO 2 IN/OUT     | P V RNG2         | DIG B      | 1/16     | 6840      | 08 00       | 4T02-25  | 5W40-P   |          |
| 13121    | VOLTAGE PROTECT RELAY 2 OPEN/CLOSED | V PR RY2         | DIG B      | 1/16     | 6841      | 10 00       | 4T02-25  | 5W40-S   |          |
| 13122    | TU PRESSURE 2                       | TU PRS 2         | ALOG       | 1/16     | A195      | 10 22       | 4T64-68  | 5W40-A   |          |
| 13123    | TU TEMPERATURE 2                    | TU TEMP2         | ALOG       | 1/16     | A259      | 12 31       | 4T66-68  | 5W40-B   |          |
| 13124    | EU TEMPERATURE 2                    | EU TEMP2         | ALOG       | 1/16     | A322      | 12 40       | 4T68-25  | 5W40-C   |          |
| 13125    | TAPE FOOTAGE 2                      | TAPE FT2         | ALOG       | 1/16     | A387      | 18 49       | 4T90-68  | 5W40-Z   |          |
| 13126    | CAPSTAN MOTOR SPEED 2               | CPST MS2         | ALOG       | 1/16     | A451      | 01 59       | 4T92-68  | 5W40-B   |          |
| 13127    | HWP MOTOR SPEED 2                   | HWP MS 2         | ALOG       | 1/16     | A514      | 01 68       | 4T94-25  | 5W40-G   |          |
| 13128    | CAPSTAN MOTOR CURRENT 2             | CPST MI2         | ALOG       | 1/16     | A594      | 10 79       | 4T96-44  | 5W40-J   |          |
| 13129    | PLAYBACK VOLTAGE 2                  | PBR V 2          | ALOG       | 1/16     | A667      | 09 04       | 4T80-68  | 5W40-E   |          |
| 13130    | HWP MOTOR CURRENT 2                 | HWP MI 2         | ALOG       | 1/16     | A131      | 08 13       | 4T82-68  | 5W40-H   |          |
| 13131    | RECORDER INPUT CURRENT 2            | R IN I 2         | ALOG       | 1/1      | A630      | 09 04       | 4T96-55  | 5W40-C   |          |
| 13132    | LIMITR. VOLTAGE 2                   | LMTR V 2         | ALOG       | 1/16     | A196      | 12 22       | 4T84-70  | 5W40-D   |          |
| 13133    | SERVO VOLTAGE 2                     | SERV V 2         | ALOG       | 1/16     | A261      | 18 31       | 4T86-14  | 5W40-F   |          |
| 13134    | CONVERTER OUTPUT 5.6V NO 2          | 5.6CNV2          | ALOG       | 1/16     | A463      | 15 60       | 4T92-49  | 5W40-K   |          |

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RBV CAMERA CONTROLLER

|       |                              |          |       |      |      |       |         |         |         |
|-------|------------------------------|----------|-------|------|------|-------|---------|---------|---------|
| 14000 | CALIBRATE ENABLE/DISABLE     | CALIBRAT | ALOG  | 1/16 | A324 | 18 40 | 4T88-70 | 3R14-04 |         |
| 14001 | CCC BOARD TEMPERATURE        | CCC BD T | ALOG  | 1/16 | A388 | 01 50 | 4T90-70 | 3R14-15 |         |
| 14002 | CCC POWER SUPPLY TEMPERATURE | CCC PS T | ALOG  | 1/16 | A452 | 02 59 | 4T92-70 | 3R03-01 | 5710-75 |
| 14003 | PLUS OR MINUS 15 VOLT SUPPLY | 15V SPLY | ALOG  | 1/16 | A515 | 02 68 | 4T94-68 | 3R03-03 | 5710-76 |
| 14004 | 6, -5.25V VOLT SUPPLY        | 6-5.25V  | ALOG  | 1/16 | A593 | 08 79 | 4T96-27 | 3R03-04 | 5710-77 |
| 14005 | APERTURE CORRECTOR OUT/IN    | APT CORR | DIG B | 1/16 | 6842 | 12 00 | 4T04-75 | 3R14-03 |         |
| 14006 | CYCLE CONT/SING              | CYCLE    | DIG B | 1/16 | 6843 | 15 00 | 4T04-25 | 3R14-07 |         |
| 14007 | EXPOSURE C ON/OFF            | EXPOS C  | DIG B | 1/16 | 2857 | 15 02 | 4T02-22 | 3R14-05 |         |
| 14008 | EXPOSURE A ON/OFF            | EXPOS A  | DIG B | 1/16 | 6845 | 01 01 | 4T66-25 | 3R14-09 |         |
| 14009 | EXPOSURE B ON/OFF            | EXPOS B  | DIG B | 1/16 | 6846 | 02 01 | 4T08-75 | 3R14-10 |         |
| 14010 | 1.6 MHZ CLOCK ON/OFF         | 1.6MHZ   | DIG B | 1/16 | 6847 | 08 01 | 4T08-25 | 3R14-11 |         |
| 14011 | HORIZONTAL SYNC ON/OFF       | HOP SYNC | DIG B | 1/16 | 6848 | 10 01 | 4T02-52 | 3R14-12 |         |
| 14012 | VERTICAL SYNC ON/OFF         | VER SYNC | DIG B | 1/16 | 6849 | 12 01 | 4T02-26 | 3R14-13 |         |
| 14013 | 1HZ SYNC ON/OFF              | 1HZ SYNC | DIG B | 1/16 | 6851 | 18 01 | 4T04-20 | 3R14-14 |         |

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| FUNC NO.     | TLN FUNCTION                         | ACRONYM  | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CCNN | S/S CCNN | INT CCNN |
|--------------|--------------------------------------|----------|------------|----------|-----------|-------------|----------|----------|----------|
| 14014        | -24.5 VOLT INPUT ON/OFF              | -24V IN  | DIG B      | 1/16     | 6852      | 01 02       | 4T06-52  | 3R03-02  | 5710-78  |
| 14015        | 300 POWER ON/OFF                     | 300 PWR  | DIG B      | 1/16     | 6853      | 02 02       | 4T06-26  | 3R03-05  | 5710-79  |
| 14016        | CATHODE REACTIVATION ON/OFF          | CTM REAC | DIG B      | 1/16     | 6854      | 08 02       | 4T08-59  | 3R14-08  |          |
| 3BV CAMERA 1 |                                      |          |            |          |           |             |          |          |          |
| 14100        | VIDEO OUTPUT 1                       | VID OUT1 | ALOG       | 1/16     | A068      | 08 04       | 4T80-70  | 2R06-01  |          |
| 14101        | FOCUS CURRENT 1                      | FOC I 1  | ALOG       | 1/16     | A132      | 10 13       | 4T82-70  | 2R06-02  |          |
| 14102        | COMBINED ALIGNMENT CURRENT 1         | ALGN I 1 | ALOG       | 1/16     | A198      | 18 22       | 4T84-75  | 2R06-04  |          |
| 14103        | TEMPERATURE ELECTRONICS 1            | ELFC T 1 | ALOG       | 1/16     | A262      | 01 32       | 4T86-75  | 2R06-05  |          |
| 14104        | TEMPERATURE LOW-VOLTAGE PWR SUPPLY 1 | LVPS T 1 | ALOG       | 1/16     | A325      | 01 41       | 4T88-14  | 2R06-07  |          |
| 14105        | DEFLECTION POWER SUPPLY 1            | DFL PS 1 | ALOG       | 1/16     | A389      | 07 50       | 4T90-14  | 2R06-12  |          |
| 14106        | LOW VOLTAGE POWER SUPPLY 1           | LV PWS 1 | ALOG       | 1/16     | A453      | 08 59       | 4T92-14  | 2R06-10  |          |
| 14107        | THERMOELECTRIC UNIT CURRENT 1        | THMO I 1 | ALOG       | 1/16     | A516      | 08 68       | 4T94-70  | 2R06-03  |          |
| 14108        | VIDICON FILAMENT CURRENT 1           | VFIL I 1 | ALOG       | 1/16     | A592      | 02 79       | 4T96-04  | 5R15-09  | 5708-n1  |
| 14109        | G1 VOLTAGE 1                         | G1 VLT 1 | ALOG       | 1/16     | A069      | 10 04       | 4T80-14  | 5R15-03  | 5708-n2  |
| 14110        | TARGET VOLTAGE 1                     | TGT V 1  | ALOG       | 1/16     | A133      | 12 13       | 4T82-14  | 5R15-11  | 5708-n3  |
| 14111        | VIDICON CATHODE CURRENT 1            | VCTH I 1 | ALOG       | 1/16     | A129      | 01 23       | 4T84-24  | 5R15-01  | 5708-n4  |
| 14112        | HORIZONTAL DEFLECTION OUTPUT 1       | HOR DEF1 | ALOG       | 1/16     | A263      | 02 32       | 4T86-24  | 5R15-04  | 5708-n5  |
| 14113        | VERTICAL DEFLECTION OUTPUT 1         | VER DEF1 | ALOG       | 1/16     | A326      | 02 41       | 4T88-75  | 5R15-05  | 5708-n6  |
| 14114        | TEMPERATURE FACEPLATE 1              | FPLT T 1 | ALOG       | 1/16     | A390      | 08 50       | 4T90-25  | 5R15-14  | 5708-n7  |
| 14115        | TEMPERATURE YOKE/FOCUS COIL 1        | Y/FC T 1 | ALOG       | 1/16     | A454      | 10 59       | 4T92-75  | 5R15-06  | 5708-n8  |
| 14116        | -24.5V POWER IN. NO. 1 ON/OFF        | -24 IN 1 | DIG B      | 1/16     | 6856      | 12 02       | 4T02-55  | 2R06-06  |          |
| 14117        | -28 VOLT SHUTTER CURRENT 1 ON/OFF    | SHTR I 1 | DIG B      | 5/1      | 4832      | 14 00       | 4T02-60  | 2R06-13  |          |
| 14120        | 500 VOLTS 1 ON/OFF                   | 500V 1   | ALOG       | 1/16     | A197      | 15 22       | 4T84-14  | 5R15-08  | 5708-10  |
| 3BV CAMERA 2 |                                      |          |            |          |           |             |          |          |          |
| 14200        | VIDEO OUTPUT 2                       | VID OUT2 | ALOG       | 1/16     | A517      | 10 68       | 4T94-14  | 3R24-01  |          |
| 14201        | FOCUS CURRENT 2                      | FOC I 2  | ALOG       | 1/16     | A591      | 01 79       | 4T96-49  | 3R24-02  |          |
| 14202        | COMBINED ALIGNMENT CURRENT 2         | ALGN I 2 | ALOG       | 1/16     | A070      | 12 04       | 4T80-75  | 3R24-04  |          |
| 14203        | TEMPERATURE, ELECTRONICS 2           | ELEC T 2 | ALOG       | 1/16     | A135      | 18 13       | 4T82-28  | 3R24-05  |          |
| 14204        | TEMPERATURE, LOW VOLTAGE PWR SUP 2   | LVPS T 2 | ALOG       | 1/16     | A201      | 08 23       | 4T84-20  | 3R24-07  |          |
| 14205        | DEFLECTION POWER SUPPLY NO 2         | DFL PS 2 | ALOG       | 1/16     | A266      | 12 32       | 4T86-45  | 3R24-12  |          |
| 14206        | LOW VOLTAGE POWER SUPPLY 2           | LV PWS 2 | ALOG       | 1/16     | A327      | 08 41       | 4T88-20  | 3R24-10  |          |
| 14207        | THERMOELECTRIC UNIT CURRENT 2        | THMO I 2 | ALOG       | 1/16     | A391      | 10 50       | 4T90-28  | 3R24-03  |          |
| 14208        | VIDICON FILAMENT CURRENT 2           | VFIL I 2 | ALOG       | 1/16     | A455      | 12 59       | 4T92-28  | 5R15-02  | 5708-24  |
| 14209        | G1 VOLTAGE 2                         | G1 VLT 2 | ALOG       | 1/16     | A518      | 12 68       | 4T94-75  | 5R15-03  | 5708-25  |
| 14210        | TARGET VOLTAGE NO 2                  | TGT V 2  | ALOG       | 1/16     | A577      | 01 77       | 4T96-23  | 5R15-11  | 5708-26  |
| 14211        | VIDICON CATHODE CURRENT NO 2         | VCTH I 2 | ALOG       | 1/16     | A072      | 18 04       | 4T80-12  | 5R15-01  | 5708-27  |
| 14212        | HORIZONTAL DEFLECTION OUTPUT 2       | HOR DEF2 | ALOG       | 1/16     | A136      | 01 14       | 4T82-12  | 5R15-04  | 5708-28  |
| 14213        | VERTICAL DEFLECTION OUTPUT 2         | VER DEF2 | ALOG       | 1/16     | A202      | 10 23       | 4T84-45  | 5R15-05  | 5708-29  |
| 14214        | TEMPERATURE, FACEPLATE 2             | FPLT T 2 | ALOG       | 1/16     | A268      | 18 32       | 4T86-76  | 5R15-14  | 5708-30  |
| 14215        | TEMPERATURE, YOKE/FOCUS COIL 2       | Y/FC T 2 | ALOG       | 1/16     | A329      | 12 41       | 4T88-26  | 5R15-06  | 5708-31  |
| 14216        | -24.5V POWER IN. NO. 2 ON/OFF        | -24 IN 2 | DIG B      | 1/16     | 6860      | 02 03       | 4T06-55  | 3R24-06  |          |
| 14217        | -28 VOLT SHUTTER CURRENT 2 ON/OFF    | SHTR I 2 | DIG B      | 5/1      | 4832      | 14 00       | 4T02-1   | 3R24-13  |          |
| 14220        | 500 VOLTS 2 ON/OFF                   | 500V 2   | ALOG       | 1/16     | A260      | 15 31       | 4T86-70  | 5R15-08  | 5708-33  |

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| FUNC NO.     | TLM FUNCTION                            | ACRONYM  | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S COAN | INT CCNM |
|--------------|---|----------|------------|----------|-----------|-------------|----------|----------|----------|
| 3BV CAMERA 3 |   |          |            |          |           |             |          |          |          |
| 14300        | VIDEO OUTPUT 3                          | VID OUT3 | ALOG       | 1/16     | A392      | 12 50       | 4T90-12  | 3R40-01  |          |
| 14301        | FOCUS CURRENT 3                         | FOC I 3  | ALOG       | 1/16     | A457      | 1P 59       | 4T92-26  | 3R40-02  |          |
| 14302        | COMBINED ALIGNMENT CURRENT 3            | ALGN I 3 | ALOG       | 1/16     | A520      | 1R 68       | 4T94-12  | 3R40-04  |          |
| 14303        | TEMPERATURE, ELECTRONICS 3              | ELFC T 3 | ALOG       | 1/16     | A578      | 02 77       | 4T96-25  | 3R40-05  |          |
| 14304        | TEMPERATURE, LOW VOLTAGE POWER SUPPLY 3 | LVPS T 3 | ALOG       | 1/16     | A073      | 01 05       | 4T80-26  | 3R40-07  |          |
| 14305        | DEFLECTION POWER SUPPLY 3               | DFL PS 3 | ALOG       | 1/16     | A137      | 02 14       | 4T82-26  | 3R40-12  |          |
| 14306        | LOW VOLTAGE POWER SUPPLY 3              | LV PWS 3 | ALOG       | 1/16     | A203      | 12 23       | 4T84-72  | 3R40-10  |          |
| 14307        | THERMOELECTRIC UNIT CURRENT 3           | THMO I 3 | ALOG       | 1/16     | A269      | 01 33       | 4T86-73  | 3R40-03  |          |
| 14308        | VIDICON FILAMENT CURRENT 3              | VFIL I 3 | ALOG       | 1/16     | A331      | 1R 41       | 4T88-72  | 5R28-02  | 5708-34  |
| 14309        | 31 VOLTAGE NO 3                         | G1 VLT 3 | ALOG       | 1/16     | A394      | 1P 50       | 4T90-45  | 5R28-03  | 5708-35  |
| 14310        | TARGET VOLTAGE 3                        | TGT V 3  | ALOG       | 1/16     | A458      | 01 60       | 4T92-45  | 5R28-11  | 5708-36  |
| 14311        | VIDICON CATHODE CURRENT 3               | VCTH I 3 | ALOG       | 1/16     | A521      | 01 69       | 4T94-26  | 5R28-01  | 5708-37  |
| 14312        | HORIZONTAL DEFLECTION OUTPUT 3          | HOR DEF3 | ALOG       | 1/16     | A579      | 0P 77       | 4T96-68  | 5R28-04  | 5708-38  |
| 14313        | VERTICAL DEFLECTION OUTPUT 3            | VER DEF3 | ALOG       | 1/16     | A074      | 02 05       | 4T80-45  | 5R28-05  | 5708-39  |
| 14314        | TEMPERATURE, FACEPLATE 3                | FPLT T 3 | ALOG       | 1/16     | A138      | 0B 14       | 4T82-45  | 5R28-14  | 5708-40  |
| 14315        | TEMPERATURE, YOKE/FOCUS COIL 3          | Y/FC T 3 | ALOG       | 1/16     | A205      | 1P 23       | 4T84-73  | 5R28-06  | 5708-41  |
| 14316        | -24.5V POWER IN, NO. 3 ON/OFF           | -24 IN 3 | DIG B      | 1/16     | 8B38      | 01 00       | 4T08-51  | 3R40-06  |          |
| 14317        | -28 VOLT SHUTTER CURRENT 3 ON/OFF       | SHTR I 3 | DIG B      | 5/1      | 7B32      | 14 00       | 4T02-77  | 3R40-13  |          |
| 14320        | 500 VOLTS 3 ON/OFF                      | 500V 3   | ALOG       | 1/16     | A323      | 15 40       | 4T88-68  | 5R28-08  | 5708-43  |

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MULTISPECTRAL SCANNER

|       |                            |          |       |      |      |       |         |         |  |
|-------|----------------------------|----------|-------|------|------|-------|---------|---------|--|
| 15002 | MAIN INVERTER A/B          | MAIN INV | DIG B | 1/16 | 8B42 | 12 00 | 4T04-27 | 5M07-02 |  |
| 15003 | BAND 1 HIGH VOLTAGE A/B    | HV1 SLCT | DIG B | 1/16 | 8B43 | 15 00 | 4T04-4  | 5M07-03 |  |
| 15004 | BAND 2 HIGH VOLTAGE A/B    | HV2 SLCT | DIG B | 1/16 | 8B44 | 1P 00 | 4T06-27 | 5M07-04 |  |
| 15005 | BAND 3 HIGH VOLTAGE A/B    | HV3 SLCT | DIG B | 1/16 | 8B45 | 01 01 | 4T06-4  | 5M07-05 |  |
| 15006 | HIGH VOLTAGE ON/OFF        | HI VOLT  | DIG B | 1/16 | 8B46 | 02 01 | 4T08-27 | 5M07-06 |  |
| 15007 | BAND 1 HIGH VOLTAGE ON/OFF | BND 1 HV | DIG B | 1/16 | 8B47 | 0P 01 | 4T08-4  | 5M07-07 |  |
| 15008 | BAND 2 HIGH VOLTAGE ON/OFF | BND 2 HV | DIG B | 1/16 | 8B48 | 10 01 | 4T02-54 | 5M07-08 |  |
| 15009 | BAND 3 HIGH VOLTAGE ON/OFF | BND 3 HV | DIG B | 1/16 | 8B49 | 12 01 | 4T02-30 | 5M07-09 |  |
| 15010 | BAND 1 LOW VOLTAGE ON/OFF  | RND 1 LV | DIG B | 1/16 | 8B50 | 15 01 | 4T04-50 | 5M07-10 |  |
| 15011 | BAND 2 LOW VOLTAGE ON/OFF  | BND 2 LV | DIG B | 1/16 | 8B51 | 1P 01 | 4T04-30 | 5M07-11 |  |
| 15012 | BAND 3 LOW VOLTAGE ON/OFF  | BND 3 LV | DIG B | 1/16 | 8B53 | 02 02 | 4T06-30 | 5M07-12 |  |
| 15013 | BAND 4 LOW VOLTAGE ON/OFF  | RND 4 LV | DIG B | 1/16 | 8B54 | 0P 02 | 4T08-50 | 5M07-13 |  |
| 15014 | BAND 5 LOW VOLTAGE ON/OFF  | BND 5 LV | DIG B | 1/16 | 8B57 | 15 02 | 4T02-72 | 5M07-14 |  |
| 15015 | CALIBRATION LAMP A/B       | CLMP SLT | DIG B | 1/16 | 8B56 | 12 02 | 4T02-81 | 5M07-15 |  |
| 15016 | CALIBRATION LAMP ON/OFF    | CAL LAMP | DIG B | 1/16 | 8B57 | 15 02 | 4T02-12 | 5M07-20 |  |
| 15017 | SCAN MONITOR ON/OFF        | SCAN MON | DIG B | 1/16 | 8B58 | 1P 02 | 4T04-81 | 5M07-17 |  |
| 15018 | BAND 1 GAIN HIGH/LOW       | RND 1 GN | DIG B | 1/16 | 8B59 | 01 03 | 4T04-12 | 5M07-18 |  |
| 15019 | BAND 2 GAIN HIGH/LOW       | BND 2 GN | DIG B | 1/16 | 8B60 | 02 03 | 4T06-81 | 5M07-19 |  |
| 15020 | ROTATING SHUTTER ON/OFF    | ROT SHTR | DIG B | 1/16 | 8B61 | 0P 03 | 4T06-12 | 5M07-16 |  |

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| FJNC NO. | TLM FUNCTION                        | ACRONYM   | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CONN | INT CONN |
|----------|-------------------------------------|-----------|------------|----------|-----------|-------------|----------|----------|----------|
| 15023    | SHUTTER MONITOR SOURCE A/R          | SHTK MON  | DIG B      | 1/16     | 8B62      | 10 03       | 4T08-81  | 5P07-21  |          |
| 15027    | MUX ON/OFF                          | MULTPLYR  | DIG B      | 1/16     | 5B43      | 15 00       | 4T04-11  | 4P02-08  |          |
| 15028    | MUX-NORM/INHIBIT                    | MUX STAT  | DIG B      | 1/16     | 5B44      | 18 00       | 4T06-14  | 5P07-36  |          |
| 15029    | MUX MODE STATUS COMPRES/LINEAR      | MUX MODE  | DIG B      | 1/16     | 5B40      | 08 00       | 4T02-14  | 4P02-09  |          |
| 15030    | MID SCAN CODE OFF/ON                | MID SCAN  | DIG R      | 1/16     | 7B58      | 18 02       | 4T04-76  | 4P02-11  |          |
| 15031    | SCAN MONITOR SOURCE A/R             | SCN SRCE  | DIG B      | 1/16     | 5B41      | 10 00       | 4T02-11  | 5P07-30  |          |
| 15032    | SCANNER POWER LINE 1/2              | SCANR PL  | DIG B      | 1/16     | 5B42      | 12 00       | 4T04-14  | 5P07-32  |          |
| 15033    | SCAN MIRROR ON/OFF                  | SCN MIRR  | DIG R      | 1/16     | 5B39      | 02 00       | 4T08-28  | 5P07-24  |          |
| 15034    | SCAN MIRROR POWER LINE 1 YES/NO     | SCNM PL1  | DIG B      | 1/16     | 7B61      | 08 03       | 4T06-45  | 5P07-28  |          |
| 15035    | SCAN MIRROR POWER LINE 2 YES/NO     | SCNM PL2  | DIG B      | 1/16     | 7B60      | 02 03       | 4T06-76  | 5P07-29  |          |
| 15036    | SCAN MIRROR MODE NORMAL/INHIBIT     | SCNM MDE  | DIG B      | 1/16     | 5B45      | 01 01       | 4T06-11  | 5P07-34  |          |
| 15037    | SCAN MIRROR PWR LINE 1/2            | SMPL SLT  | DIG B      | 1/16     | 5B46      | 02 01       | 4T08-14  | 5P07-35  |          |
| 15039    | SYSTEM ON-OFF STATUS NORM/OVRD      | SYS STAT  | DIG B      | 1/16     | 9B53      | 02 02       | 4T06-05  | 5P07-33  |          |
| 15040    | MUX -6V G.P. POWER SUPPLY           | MUX -6V   | ALOG       | 1/16     | A270      | 02 33       | 4T06-46  | 4P02-01  |          |
| 15041    | A/D CONVERTER REF SUPPLY            | A/D SPLY  | ALOG       | 1/16     | A332      | 01 42       | 4T08-76  | 4P02-03  |          |
| 15042    | AVERAGE DENSITY OF DATA TRANSITIONS | AVG DENS  | ALOG       | 1/16     | A395      | 01 51       | 4T90-72  | 4P02-04  |          |
| 15043    | FIBER OPTICS PLATE 1 TEMPERATURE    | FOPT 1 T  | ALOG       | 1/16     | A459      | 02 60       | 4T92-72  | 5P11-04  |          |
| 15044    | FIBER OPTICS PLATE 2 TEMPERATURE    | FOPT 2 T  | ALOG       | 1/16     | A522      | 02 69       | 4T94-45  | 5P11-05  |          |
| 15045    | MUX TEMPERATURE                     | MUX TEMP  | ALOG       | 1/16     | A580      | 10 77       | 4T96-70  | 4P02-05  |          |
| 15046    | ELECTRONICS COVER TEMPERATURE       | EL CVR T  | ALOG       | 1/16     | A075      | 08 05       | 4T80-72  | 5P11-06  |          |
| 15047    | POWER SUPPLIES TEMPERATURE          | P SPLY T  | ALOG       | 1/16     | A139      | 10 14       | 4T82-72  | 5P11-07  |          |
| 15048    | SCAN MIRROR REGULATOR TEMP          | SM REG T  | ALOG       | 1/16     | A206      | 01 24       | 4T84-48  | 5P11-08  |          |
| 15049    | SCAN MIRROR DRIVE ELECTRONICS TEMP  | SMDR E T  | ALOG       | 1/16     | A271      | 08 33       | 4T86-45  | 5P11-09  |          |
| 15050    | SCAN MIRROR DRIVE COIL TEMP         | SMDR C T  | ALOG       | 1/16     | A333      | 02 42       | 4T88-73  | 5P11-10  |          |
| 15051    | SCAN MIRROR TEMPERATURE             | SCN MR T  | ALOG       | 1/16     | A396      | 02 51       | 4T90-76  | 5P11-11  |          |
| 15052    | ROTATING SHUTTER HOUSING TEMP       | PSH HG T  | ALOG       | 1/16     | A582      | 15 77       | 4T96-75  | 5P11-31  |          |
| 15053    | SCAN MIRROR REGULATED VOLTAGE       | SM REG V  | ALOG       | 1/16     | A523      | 08 69       | 4T94-72  | 5P11-34  |          |
| 15054    | CALIBRATION LAMP CURRENT            | CALAMP I  | ALOG       | 1/16     | A581      | 12 77       | 4T96-14  | 5P11-13  |          |
| 15055    | BAND 1 PLUS AND MINUS               |           |            |          |           |             |          |          |          |
|          | 15 VDC REGULATOR                    | BND1 15V  | ALOG       | 1/16     | A076      | 10 05       | 4T80-76  | 5P11-14  |          |
| 15056    | BAND 2 PLUS AND MINUS               |           |            |          |           |             |          |          |          |
|          | 15 VDC REGULATOR                    | BND2 15V  | ALOG       | 1/16     | A148      | 12 14       | 4T82-76  | 5P11-15  |          |
| 15057    | BAND 3 PLUS AND MINUS               |           |            |          |           |             |          |          |          |
|          | 15 VDC REGULATOR                    | BND3 15V  | ALOG       | 1/16     | A207      | 02 24       | 4T84-49  | 5P11-16  |          |
| 15058    | BAND 4 PLUS AND MINUS               |           |            |          |           |             |          |          |          |
|          | 15 VDC REGULATOR                    | BND4 15V  | ALOG       | 1/16     | A272      | 10 33       | 4T86-04  | 5P11-17  |          |
| 15059    | -15 TIM REGULATED VOLTAGE           | TLM -15V  | ALOG       | 1/16     | A334      | 08 42       | 4T88-40  | 5P11-12  |          |
| 15060    | 12 VDC -6VDC REGULATOR              | 12-6VDC   | ALOG       | 1/16     | A397      | 08 51       | 4T90-73  | 5P11-19  |          |
| 15061    | 5 VDC LOGIC REGULATOR               | LOGIC 5V  | ALOG       | 1/16     | A461      | 10 60       | 4T92-73  | 5P11-20  |          |
| 15062    | 19 VDC RECTIFIER OUTPUT             | RECT 19V  | ALOG       | 1/16     | A524      | 10 69       | 4T94-76  | 5P11-21  |          |
| 15063    | -19 VDC RECTIFIER OUTPUT            | RECT -19V | ALOG       | 1/16     | A583      | 18 77       | 4T96-28  | 5P11-22  |          |
| 15064    | HIGH VOLTAGE MONITOR BAND 1 (A)     | BND1 HVA  | ALOG       | 1/16     | A077      | 12 05       | 4T80-73  | 5P11-23  |          |
| 15065    | HIGH VOLTAGE MONITOR BAND 1 (B)     | BND1 HVB  | ALOG       | 1/16     | A142      | 18 14       | 4T82-48  | 5P11-24  |          |
| 15066    | HIGH VOLTAGE MONITOR BAND 2 (A)     | BND2 HVA  | ALOG       | 1/16     | A208      | 08 24       | 4T84-04  | 5P11-25  |          |

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| FUNC NO. | TLM FUNCTION                            | ACRONYM  | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CCAN | INT CCNN |
|----------|---|----------|------------|----------|-----------|-------------|----------|----------|----------|
| 15067    | HIGH VOLTAGE MONITOR BAND 2 (B)         | RND2 HVB | ALOG       | 1/16     | A273      | 12 33       | 4T86-27  | 5M11-26  |          |
| 15068    | HIGH VOLTAGE MONITOR BAND 3 (A)         | RND3 HVA | ALOG       | 1/16     | A335      | 10 42       | 4T88-49  | 5M11-27  |          |
| 15069    | HIGH VOLTAGE MONITOR BAND 3 (B)         | RND3 HVB | ALOG       | 1/16     | A398      | 10 51       | 4T90-45  | 5M11-28  |          |
| 15070    | SHUTTER MOTOR CONTROL INTEGRATOR OUTPUT | SHTR MCI | ALOG       | 1/16     | A462      | 12 60       | 4T92-45  | 5M11-29  |          |
| 15071    | SCAN MIRROR DRIVE CLOCK                 | SMDR CLK | ALOG       | 1/16     | A525      | 12 69       | 4T94-73  | 5M11-37  |          |
| 15072    | 3AND 5A GAIN PIT 1 1/0                  | 5A GN B1 | DIG. B     | 1/16     | 1855      | 10 02       | 4T08-67  | 5M07-23  |          |
| 15073    | 3AND 5A GAIN PIT 2 1/0                  | 5A GN F2 | DIG. B     | 1/16     | 2855      | 10 02       | 4T08-10  | 5M07-25  |          |
| 15074    | 3AND 5A GAIN PIT 3 1/0                  | 5A GN G3 | DIG. B     | 1/16     | 3855      | 10 02       | 4T08-24  | 5M07-26  |          |
| 15075    | 3AND 5B GAIN PIT 1 1/0                  | 5B GN B1 | DIG. B     | 1/16     | 2859      | 01 03       | 4T04-22  | 5M07-40  |          |
| 15076    | 3AND 5B GAIN PIT 2 1/0                  | 5B GN F2 | DIG. B     | 1/16     | 6859      | 01 03       | 4T04-72  | 5M07-41  |          |
| 15077    | 3AND 5B GAIN PIT 3 1/0                  | 5B GN B3 | DIG. B     | 1/16     | 7859      | 01 03       | 4T04-45  | 5M07-42  |          |
| 15083    | DOOR MOTOR POWER ON/OFF                 | DR MTR P | DIG. B     | 1/16     | 3852      | 01 02       | 4T06-17  | 5M07-22  |          |
| 15084    | DOOR DIRECTION OPEN/CLOSE               | DR DIR   | DIG. B     | 1/16     | 0850      | 15 01       | 4T04-43  | 5M07-38  |          |
| 15085    | DOOR MOVING YES/NO                      | DR EVNG  | DIG. B     | 1/16     | 8834      | 17 02       | 4T04-51  | 5M07-44  |          |
| 15086    | DOOR HOLD ON/OFF                        | DR HOLD  | DIG. B     | 1/16     | 1860      | 02 03       | 4T06-21  | 5M07-43  |          |
| 15087    | DOOR CLOSED YES/NO                      | DR CLSD  | DIG. B     | 1/16     | 8839      | 02 00       | 4T08-31  | 5M07-47  |          |
| 15088    | DOOR OUTGAS YES/NO                      | DR OTGS  | DIG. B     | 1/16     | 2840      | 08 00       | 4T02-57  | 5M07-48  |          |
| 15089    | DOOR OPEN YES/NO                        | DR OPEN  | DIG. B     | 1/16     | 2842      | 12 00       | 4T04-57  | 5M07-49  |          |
| 15090    | DOOR OVERRIDE RESFT/ACTUATE             | DR OVRD  | DIG. B     | 1/16     | 7857      | 15 02       | 4T02-45  | 5M07-45  |          |
| 15091    | DOOR OVERRIDE SAFE/ARM                  | DR OVRD  | DIG. B     | 1/16     | 6862      | 10 03       | 4T08-55  | 5M07-46  |          |
| 15092    | OUTGAS HEATER ON/OFF                    | OTGS HTR | DIG. B     | 1/16     | 3863      | 12 03       | 4T08-07  | 5M07-50  |          |
| 15101    | CHN 1 SCANNER VIDEO OUTPUT              | CH1 SVO  | ALOG       | 1/16     | A079      | 18 05       | 4T80-49  | 5M15-01  |          |
| 15102    | CHN 2 SCANNER VIDEO OUTPUT              | CH2 SVO  | ALOG       | 1/16     | A080      | 01 05       | 4T80-04  | 5M15-02  |          |
| 15103    | CHN 3 SCANNER VIDEO OUTPUT              | CH3 SVO  | ALOG       | 1/16     | A081      | 02 06       | 4T80-27  | 5M15-03  |          |
| 15104    | CHN 4 SCANNER VIDEO OUTPUT              | CH4 SVO  | ALOG       | 1/16     | A082      | 08 06       | 4T80-44  | 5M15-04  |          |
| 15105    | CHN 5 SCANNER VIDEO OUTPUT              | CH5 SVO  | ALOG       | 1/16     | A083      | 14 06       | 4T80-47  | 5M15-05  |          |
| 15106    | CHN 6 SCANNER VIDEO OUTPUT              | CH6 SVO  | ALOG       | 1/16     | A084      | 12 06       | 4T80-71  | 5M15-06  |          |
| 15107    | CHN 7 SCANNER VIDEO OUTPUT              | CH7 SVO  | ALOG       | 1/16     | A143      | 01 15       | 4T82-49  | 5M15-08  |          |
| 15108    | CHN 8 SCANNER VIDEO OUTPUT              | CH8 SVO  | ALOG       | 1/16     | A144      | 02 15       | 4T82-04  | 5M15-09  |          |
| 15109    | CHN 9 SCANNER VIDEO OUTPUT              | CH9 SVO  | ALOG       | 1/16     | A145      | 08 15       | 4T82-27  | 5M15-10  |          |
| 15110    | CHN 10 SCANNER VIDEO OUTPUT             | CH10 SVO | ALOG       | 1/16     | A146      | 10 15       | 4T82-44  | 5M15-11  |          |
| 15111    | CHN 11 SCANNER VIDEO OUTPUT             | CH11 SVO | ALOG       | 1/16     | A147      | 12 15       | 4T82-47  | 5M15-12  |          |
| 15112    | CHN 12 SCANNER VIDEO OUTPUT             | CH12 SVO | ALOG       | 1/16     | A148      | 15 15       | 4T82-71  | 5M15-13  |          |
| 15113    | CHN 13 SCANNER VIDEO OUTPUT             | CH13 SVO | ALOG       | 1/16     | A274      | 15 33       | 4T86-44  | 5M15-15  |          |
| 15114    | CHN 14 SCANNER VIDEO OUTPUT             | CH14 SVO | ALOG       | 1/16     | A275      | 18 33       | 4T86-47  | 5M15-16  |          |
| 15115    | CHN 15 SCANNER VIDEO OUTPUT             | CH15 SVO | ALOG       | 1/16     | A276      | 01 34       | 4T86-71  | 5M15-17  |          |

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| FJNC NO.                     | TLN        | FUNCTION             | ACRONYM | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CCNN | INT CCNN |
|------------------------------|------------|----------------------|---------|------------|----------|-----------|-------------|----------|----------|----------|
| 15116                        | CHN 16     | SCANNER VIDEO OUTPUT | CH16    | SVO        | ALOG     | 1/16      | A277        | 02 34    | 4T86-51  | 5M15-18  |
| 15117                        | CHN 17     | SCANNER VIDEO OUTPUT | CH17    | SVO        | ALOG     | 1/16      | A278        | 08 34    | 4T86-13  | 5M15-19  |
| 15118                        | CHN 18     | SCANNER VIDEO OUTPUT | CH18    | SVO        | ALOG     | 1/16      | A279        | 10 34    | 4T86-46  | 5M15-37  |
| 15119                        | CHN 19     | SCANNER VIDEO OUTPUT | CH19    | SVO        | ALOG     | 1/16      | A527        | 18 69    | 4T94-49  | 5M15-22  |
| 15120                        | CHN 20     | SCANNER VIDEO OUTPUT | CH20    | SVO        | ALOG     | 1/16      | A528        | 01 70    | 4T94-04  | 5M15-23  |
| 15121                        | CHN 21     | SCANNER VIDEO OUTPUT | CH21    | SVO        | ALOG     | 1/16      | A529        | 09 70    | 4T94-27  | 5M15-24  |
| 15122                        | CHN 22     | SCANNER VIDEO OUTPUT | CH22    | SVO        | ALOG     | 1/16      | A530        | 08 70    | 4T94-44  | 5M15-25  |
| 15123                        | CHN 23     | SCANNER VIDEO OUTPUT | CH23    | SVO        | ALOG     | 1/16      | A531        | 10 70    | 4T94-47  | 5M15-26  |
| 15124                        | CHN 24     | SCANNER VIDEO OUTPUT | CH24    | SVO        | ALOG     | 1/16      | A532        | 12 70    | 4T94-71  | 5M15-27  |
| 15126                        | CHANNEL 26 | SCANNER VIDEO OUTPUT | CH26    | SVO        | ANALOG   | 1/16      | A393        | 15 50    | 4T90-26  | 5M15-30  |
| JCS RECEIVER                 |            |                      |         |            |          |           |             |          |          |          |
| 16001                        | RECEIVER 1 | SIG STRENGTH         | RCVR1   | SG         | ALOG     | 1/16      | A149        | 18 15    | 4T82-51  | 3D04-2   |
| 16002                        | RECEIVER 1 | TEMPERATURE          | RCVR1   | T          | ALOG     | 1/16      | A209        | 10 24    | 4T84-27  | 3D04-1   |
| 16003                        | RECEIVER 1 | PWR SUPPLY VOLTAGE   | RCVR1   | V          | ALOG     | 1/16      | A336        | 12 42    | 4T88-04  | 3D04-3   |
| 16004                        | RECEIVER 2 | SIGNAL STRENGTH      | RCVR2   | SG         | ALOG     | 1/16      | A399        | 12 51    | 4T90-49  | 2D04-2   |
| 16005                        | RECEIVER 2 | TEMPERATURE          | RCVR2   | T          | ALOG     | 1/16      | A444        | 18 60    | 4T92-04  | 2D04-1   |
| 16006                        | RECEIVER 2 | PWR SUPPLY VOLTAGE   | RCVR2   | V          | ALOG     | 1/16      | A584        | 01 78    | 4T96-12  | 2D04-3   |
| NOTE ALSO SEE ELEC. I.F. S/S |            |                      |         |            |          |           |             |          |          |          |

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\* P/O 1000,2000,6000,7000,8000,11000 \*  
\* 12000,13000,14000,15000 ELEC IE S/S \*  
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| FJNC NO.                         | TLH FUNCTION                             | ACRONYM             | SIGNL TYPE       | SAMP SEC        | GATE ADDR       | COLUMN /ROW      | VIP CONN           | S/S CCAN           | INT CCNN           |
|----------------------------------|--|---------------------|------------------|-----------------|-----------------|------------------|--------------------|--------------------|--------------------|
| INTERFACE SWITCHING MODULE (ISM) |  |                     |                  |                 |                 |                  |                    |                    |                    |
| (PART OF ACS S/S)                |  |                     |                  |                 |                 |                  |                    |                    |                    |
| 100 <del>8</del>                 | SCANNER 1 EN/DIS                         | SCAN 1              | DIG B            | 1/16            | 5852            | 01 02            | 4T06-15            | 4X05-10            | 5717-05            |
| 1017                             | SCANNER 2 EN/DIS                         | SCAN 2              | DIG B            | 1/16            | 5851            | 18 01            | 4T04-46            | 4X05-12            | 5717-06            |
| <del>1234</del>                  | <del>SAD RIGHT POWER UNFUSED/FUSED</del> | <del>SDR PWR</del>  | <del>DIG B</del> | <del>1/16</del> | <del>5855</del> | <del>10 02</del> | <del>4T08-48</del> | <del>4X05-27</del> | <del>5717-12</del> |
| 1251                             | SAD LEFT POWER UNFUSED/FUSED             | SDL PWR             | DIG B            | 1/16            | 5854            | 08 02            | 4T08-15            | 4X05-25            | 5717-11            |
| 1290                             | SINGLE SCANNER MODE UNLOCK/LOCK          | SGI SCNR            | DIG B            | 1/16            | 5848            | 10 01            | 4T02-15            | 4X05-14            | 5717-07            |
| <del>1291</del>                  | <del>SCANNER DISABLE SELECT 2/1</del>    | <del>SCAN DIS</del> | <del>DIG B</del> | <del>1/16</del> | <del>5850</del> | <del>15 01</del> | <del>4T04-15</del> | <del>4X05-08</del> | <del>5717-04</del> |
| 1292                             | RIGHT COSINE POT OUT                     | COS SIGR            | ALOG             | 1/16            | A312            | 02 39            | 4T86-05            | 4X05-16            | 5717-16            |
| 1293                             | LEFT COSINE POT OUT                      | COS SIGL            | ALOG             | 1/16            | A313            | 08 39            | 4T86-02            | 4X03-16            | 5717-13            |
| (PART OF OA S/S)                 |  |                     |                  |                 |                 |                  |                    |                    |                    |
| <del>2020</del>                  | <del>3A INHUSTER HEATERS ON/OFF</del>    | <del>THRS MTR</del> | <del>DIG B</del> | <del>1/16</del> | <del>5859</del> | <del>01 03</del> | <del>4T04-46</del> | <del>4X03-27</del> | <del>5717-27</del> |
| (PART OF ATT. SENS. S/S)         |  |                     |                  |                 |                 |                  |                    |                    |                    |
| 3006                             | ATTITUDE SENSOR ON/OFF                   | ATT SENS            | DIG B            | 1/16            | 5853            | 02 02            | 4T06-48            | 4X05-6             | 5717-03            |
| (PART OF THERMAL S/S)            |  |                     |                  |                 |                 |                  |                    |                    |                    |
| 7127                             | COMP. LOAD 7 ON/OFF                      | CMP LD 7            | DIG B            | 1/16            | 5861            | 08 03            | 4T06-40            | 4X05-4             | 5717-02            |
| <del>7128</del>                  | <del>COMP. LOAD 8 ON/OFF</del>           | <del>CMP LD 8</del> | <del>DIG B</del> | <del>1/16</del> | <del>5862</del> | <del>10 03</del> | <del>4T08-53</del> | <del>4X05-2</del>  | <del>5717-01</del> |
| 7130                             | AUX. LOAD PANNEL 1, TEMP.                | AUX P1 T            | ALOG             | 1/16            | A085            | 15 06            | 4T00-51            | 4X03-48            | 5717-15            |
| 7131                             | AUX. LOAD PANNEL 2, TEMP.                | AUX P2 T            | ALOG             | 1/16            | A210            | 12 24            | 4T84-44            | 4X05-48            | 5717-17            |
| (PART OF C. AND D.H. S/S)        |  |                     |                  |                 |                 |                  |                    |                    |                    |
| <del>9060</del>                  | <del>SEP SWITCH 1 BYPASS NO/YES</del>    | <del>SS 1BYP</del>  | <del>DIG B</del> | <del>1/16</del> | <del>5856</del> | <del>12 02</del> | <del>4T02-53</del> | <del>4X05-19</del> | <del>5717-08</del> |
| 9061                             | SEP SWITCH 2 BYPASS NO/YES               | SS 2BYP             | DIG B            | 1/16            | 5857            | 15 02            | 4T02-46            | 4X05-21            | 5717-09            |
| 9062                             | CLOCK FUSED PWR. PRI/PEP                 | CLK FUSE            | DIG B            | 1/16            | 5858            | 18 02            | 4T04-53            | 4X05-23            | 5717-10            |
| <del>9113</del>                  | <del>USEN STADAN CHANNEL A/B B/A</del>   | <del>M S CHN</del>  | <del>DIG B</del> | <del>1/16</del> | <del>6858</del> | <del>10 02</del> | <del>4T04-55</del> | <del>4X03-19</del> | <del>5717-05</del> |
| 11020                            | JSB XMTR PRIMARY POWER OFF/ON            | P JSR PW            | DIG B            | 1/16            | 7843            | 15 00            | 4T04-29            | 4X03-12            | 5717-22            |
| 11021                            | JSB XMTR REDUNDANT POWER OFF/ON          | R JSR PW            | DIG B            | 1/16            | 1842            | 12 00            | 4T04-37            | 4X03-08            | 5717-20            |
| <del>12000</del>                 | <del>4IDEBAND POWER AMPLIFIERS</del>     |                     |                  |                 |                 |                  |                    |                    |                    |
|                                  | PRIMARY POWER OFF/ON                     | P WPA PW            | DIG B            | 1/16            | 7842            | 12 00            | 4T04-13            | 4X03-14            | 5717-23            |
| 12100                            | 4IDEBAND POWER AMPLIFIERS                |                     |                  |                 |                 |                  |                    |                    |                    |
|                                  | REDUNDANT POWER OFF/ON                   | R WPA PW            | DIG B            | 1/16            | 6844            | 18 00            | 4T06-75            | 4X03-10            | 5717-21            |
| (PART OF A.P.U.)                 |  |                     |                  |                 |                 |                  |                    |                    |                    |
| 13210                            | APU USB/PA P.U.T.SIGNAL ENA/DIS          | U/P TSIG            | DIG B            | 1/16            | 7844            | 18 00            | 4T06-13            | 4X03-04            | 5717-18            |

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| FJNC NO. | TLN FUNCTION | ACRONYM | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /ROW | VIP CONN | S/S CCNN | INT CCNN |
|----------|--------------|---------|------------|----------|-----------|-------------|----------|----------|----------|
|----------|--------------|---------|------------|----------|-----------|-------------|----------|----------|----------|

(PART OF PAYLOAD S/S)

|       |              |        |          |       |      |      |       |         |         |         |
|-------|--------------|--------|----------|-------|------|------|-------|---------|---------|---------|
| 14118 | CAMERA NO. 1 | ON/OFF | CAMERA 1 | DIG B | 1/16 | 6855 | 10 02 | 4T08-26 | 4X11-42 | 5717-32 |
| 14218 | CAMERA NO. 2 | ON/OFF | CAMERA 2 | DIG B | 1/16 | 2861 | 08 03 | 4T06-22 | 4X11-45 | 5717-35 |
| 14318 | CAMERA NO. 3 | ON/OFF | CAMERA 3 | DIG B | 1/16 | 6863 | 12 03 | 4T08-72 | 4X01-42 | 5717-09 |
| 15001 | MSS SYSTEM   | ON/OFF | MSS SYST | DIG B | 1/16 | 8841 | 10 00 | 4T02-04 | 4X23-41 | 5717-37 |
| 15038 | MSS HEATER   | ON/OFF | MSS HTR  | DIG B | 1/16 | 5860 | 02 03 | 4T06-53 | 4X03-2  | 5717-24 |

POWER SWITCHING MODULE (PSM)

(PART OF OA S/S)

|      |                      |         |          |       |      |      |       |         |         |         |
|------|----------------------|---------|----------|-------|------|------|-------|---------|---------|---------|
| 2030 | JA SOL POWER ENA/DIS |         | SOL PWR  | DIG B | 1/1  | 5837 | 16 04 | 4T06-28 | 5F13-12 | 5715-13 |
| 2035 | JA TIMER             | ENA/DIS | OA TIMER | DIG B | 1/16 | 5863 | 12 03 | 4T08-46 | 5F13-26 | 5715-01 |

(PART OF POWER S/S)

|      |                                       |  |          |       |      |      |       |         |         |         |
|------|---------------------------------------|--|----------|-------|------|------|-------|---------|---------|---------|
| 6079 | PAYLOAD FUSE BLOW BIAS VOLTAGE        |  | FS BLD V | ALOG  | 1/16 | A337 | 15 42 | 4T08-27 | 5F13-10 | 5715-11 |
| 6101 | PSM IN RELAY CONFIGURATION MIXED/COMM |  | PRM AGE  | DIG B | 1/16 | 6850 | 15 01 | 4T04-52 | 5F13-32 | 5715-12 |
| 6102 | PSM RELAY RUS ENA/DIS                 |  | PSM RLYS | DIG B | 1/16 | 1858 | 18 02 | 4T04-21 | 4X03-21 | 5717-26 |

(PART OF A.P.U.)

|       |  |  |         |       |      |      |       |         |         |         |
|-------|--|--|---------|-------|------|------|-------|---------|---------|---------|
| 13209 | APU S PAYLOAD B.U.T. SIG ENA/DIS                   |  | PL TSIG | DIG B | 1/16 | 7846 | 02 01 | 4T08-13 | 5F13-04 | 5715-09 |
| 13211 | SEARCH TRACK (1+2) DATA TO APU (A+B) NORM/SWITCHED |  | ST DATA | DIG B | 1/16 | 7845 | 01 01 | 4T06-29 | 5F13-08 | 5715-06 |

(PART OF PAYLOAD S/S)

|       |                           |          |          |       |      |      |       |         |         |         |
|-------|---------------------------|----------|----------|-------|------|------|-------|---------|---------|---------|
| 15000 | MSS POWER ENABLE/DISABLE  |          | MSS PWR  | DIG B | 1/16 | 7847 | 08 01 | 4T08-29 | 5F13-47 | 5715-10 |
| 14017 | RBV SHUTTER PWR           | ON/OFF   | SHTR PWR | DIG B | 1/16 | 5849 | 12 01 | 4T02-48 | 5F13-23 | 5715-07 |
| 14400 | RBV MAGNETIC COMPENSATOR  | ENA/DIS  | MAG COMP | DIG B | 1/16 | 5838 | 01 00 | 4T08-74 | 5F15-12 | 5715-32 |
| 14401 | RBV MAGNETIC COMP CURRENT | HIGH/LOW | MG CMP I | DIG B | 1/16 | 8840 | 08 00 | 4T02-27 | 5F15-24 | 5715-27 |
| 14121 | RBV 1 THERMOELECTRIC MOD  | ENA/DIS  | THM MD 1 | DIG B | 1/16 | 7841 | 16 00 | 4T02-29 | 5F13-35 | 5715-05 |
| 14221 | RBV 2 THERMOELECTRIC MOD  | ENA/DIS  | THM MD 2 | DIG B | 1/16 | 7838 | 01 00 | 4T08-77 | 5F13-46 | 5715-02 |
| 14321 | RBV 3 THERMOELECTRIC MOD  | ENA/DIS  | THM MD 3 | DIG B | 1/16 | 7839 | 02 00 | 4T08-70 | 5F13-38 | 5715-03 |

PART OF C AND DH S/S

|       |                           |               |           |       |      |      |       |         |         |         |
|-------|---------------------------|---------------|-----------|-------|------|------|-------|---------|---------|---------|
| 11022 | USB XMTRS OFF SIG ENA/DIS |               | USBV OFF  | DIG B | 1/16 | 7840 | 08 00 | 4T02-13 | 5F15-48 | 5715-04 |
| 13035 | VTR 1 CONTROL             | NORM/REVERSED | VTR 1 CON | DIG B | 1/16 | 1838 | 01 00 | 4T08-60 | 5F13-31 | SPLICE  |
| 13135 | VTR 2 CONTROL             | NORM/REVERSED | VTR 2 CON | DIG B | 1/16 | 1846 | 02 01 | 4T08-32 | 5F13-41 | SPLICE  |
| 14018 | RBV PRIMARY CONTROL       | ENA/DIS       | RBV PCON  | DIG B | 1/16 | 1854 | 08 02 | 4T08-20 | 5F13-49 | SPLICE  |

C-42

| FUNC NO.                | TLM FUNCTION                                | ACRONYM   | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /POW | VIP CONN | S/E CCNN | IAT CCNN |
|-------------------------|---|-----------|------------|----------|-----------|-------------|----------|----------|----------|
| AUX PROCESSING UNIT APU |   |           |            |          |           |             |          |          |          |
| 13200                   | -24.5 INPUT POWER                           | APII-24.5 | ALOG       | 1/16     | A401      | 18 51       | 4T90-27  | 3E06-13  |          |
| 13201                   | -12V SUPPLY                                 | APII -12V | ALOG       | 1/16     | A465      | 01 61       | 4T92-27  | 3E06-15  |          |
| 13202                   | TEMPERATURE                                 | APII TEMP | ALOG       | 1/16     | A585      | 02 78       | 4T96-26  | 3E06-14  |          |
| 13207                   | 34 MIN. PL R.U.T. START SIG. ON/OFF         | 34M PL    | DIG B      | 1/16     | 7B48      | 10 01       | 4T02-80  | 3E06-04  |          |
| 13208                   | 34 MINUTE USB/PA R.U.T. START SIGNAL ON/OFF | 34M U/PA  | DIG B      | 1/16     | 7B49      | 12 01       | 4T02-71  | 3E06-07  |          |
| 13212                   | POWER MODE NORM/STBY                        | PWR MODE  | DIG B      | 1/16     | 1B48      | 10 01       | 4T02-20  | 3E06-16  |          |

THE FOLLOWING ARE UTILIZED AS SPECIAL FUNCTIONS

|       |                          |          |       |     |      |       |         |         |  |
|-------|--------------------------|----------|-------|-----|------|-------|---------|---------|--|
| 17000 | SEARCH TRACK 1, 1/2 DATA | STK1 1/2 | DIG A | 1/1 | DA00 | 16 00 | 4T30-31 | 3E04-09 |  |
| 17001 | SEARCH TRACK 1, 2/2 DATA | STK1 2/2 | DIG A | 1/1 | DA01 | 17 00 | 4T30-33 | 3E04-10 |  |
| 17002 | SEARCH TRACK 2, 1/2 DATA | STK2 1/2 | DIG A | 1/1 | DA02 | 16 01 | 4T30-30 | 3E04-11 |  |
| 17003 | SEARCH TRACK 2, 2/2 DATA | STK2 2/2 | DIG A | 1/1 | DA03 | 17 01 | 4T30-17 | 3E04-12 |  |

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| FUNC NO. | TLM FUNCTION | ACRONYM | SIGNL TYPE | SAMP SEC | GATE ADDR | COLUMN /FDW | VIP CONN | S/S CCNN | INT CCNN |
|----------|--------------|---------|------------|----------|-----------|-------------|----------|----------|----------|
|----------|--------------|---------|------------|----------|-----------|-------------|----------|----------|----------|

## ( PART OF POWER S/S )

|      |                         |          |   |       |      |      |       |         |         |
|------|-------------------------|----------|---|-------|------|------|-------|---------|---------|
| 6080 | SHUNT LOAD 1 CURRENT    | SHUNT1   | I | ALOG  | 1/16 | A103 | 08 09 | 4T00-34 | 1F42-05 |
| 6081 | SHUNT LOAD 2 CURRENT    | SHUNT2   | I | ALOG  | 1/16 | A167 | 10 18 | 4T02-34 | 1F42-06 |
| 6082 | SHUNT LOAD 3 CURRENT    | SHUNT3   | I | ALOG  | 1/16 | A231 | 12 27 | 4T04-34 | 1F42-07 |
| 6083 | SHUNT LOAD 4 CURRENT    | SHUNT4   | I | ALOG  | 1/16 | A295 | 15 36 | 4T06-34 | 1F42-08 |
| 6084 | SHUNT LOAD 5 CURRENT    | SHUNT5   | I | ALOG  | 1/16 | A359 | 18 45 | 4T08-34 | 1F42-19 |
| 6085 | SHUNT LOAD 6 CURRENT    | SHUNT6   | I | ALOG  | 1/16 | A423 | 01 55 | 4T00-34 | 1F42-20 |
| 6086 | SHUNT LOAD 7 CURRENT    | SHUNT7   | I | ALOG  | 1/16 | A487 | 02 64 | 4T02-34 | 1F42-08 |
| 6087 | SHUNT LOAD 8 CURRENT    | SHUNT8   | I | ALOG  | 1/16 | A551 | 08 73 | 4T04-34 | 1F42-21 |
| 6089 | SHUNT LOAD #A# ON/OFF   | SHUNT A  |   | DIG B | 1/16 | 0838 | 01 00 | 4T08-84 | 1F42-39 |
| 6090 | SHUNT LOAD #B# ON/OFF   | SHUNT B  |   | DIG B | 1/16 | 0845 | 01 01 | 4T06-40 | 1F42-02 |
| 6091 | SHUNT LOAD #C# ON/OFF   | SHUNT C  |   | DIG B | 1/16 | 0852 | 01 02 | 4T06-43 | 1F42-01 |
| 6092 | SHUNT LOAD #D# ON/OFF   | SHUNT D  |   | DIG B | 1/16 | 0859 | 01 03 | 4T04-62 | 1F42-42 |
| 6093 | AUXILIARY LOAD 1 ON/OFF | AUX LD 1 |   | DIG B | 1/16 | 0839 | 02 00 | 4T08-39 | 1F42-03 |
| 6094 | AUXILIARY LOAD 2 ON/OFF | AUX LD 2 |   | DIG B | 1/16 | 0846 | 02 01 | 4T08-60 | 1F42-04 |
| 6095 | AUXILIARY LOAD 3 ON/OFF | AUX LD 3 |   | DIG B | 1/16 | 0853 | 02 02 | 4T06-36 | 1F42-36 |
| 6096 | AUXILIARY LOAD 4 ON/OFF | AUX LD 4 |   | DIG B | 1/16 | 0860 | 02 03 | 4T06-24 | 1F42-37 |
| 6097 | AUXILIARY LOAD 5 ON/OFF | AUX LD 5 |   | DIG B | 1/16 | 0862 | 10 03 | 4T08-23 | 1F42-38 |

## (PART OF THERMAL S/S)

|      |                    |          |  |       |      |      |       |         |         |
|------|--------------------|----------|--|-------|------|------|-------|---------|---------|
| 7121 | COMP LOAD 1 ON/OFF | CMP LD 1 |  | DIG B | 1/16 | 7850 | 15 01 | 4T04-80 | 1F42-09 |
| 7122 | COMP LOAD 2 ON/OFF | CMP LD 2 |  | DIG B | 1/16 | 7852 | 01 02 | 4T06-80 | 1F42-27 |
| 7123 | COMP LOAD 3 ON/OFF | CMP LD 3 |  | DIG B | 1/16 | 7853 | 02 02 | 4T06-71 | 1F42-28 |
| 7124 | COMP LOAD 4 ON/OFF | CMP LD 4 |  | DIG B | 1/16 | 7854 | 08 02 | 4T08-80 | 1F42-22 |
| 7125 | COMP LOAD 5 ON/OFF | CMP LD 5 |  | DIG B | 1/16 | 7855 | 10 02 | 4T08-71 | 1F42-23 |
| 7126 | COMP LOAD 6 ON/OFF | CMP LD 6 |  | DIG B | 1/16 | 7856 | 12 02 | 4T02-76 | 1F42-24 |

## (PART OF C+DH S/S)

|      |           |         |  |       |     |      |       |  |  |
|------|-----------|---------|--|-------|-----|------|-------|--|--|
| 9057 | TICK/TOCK | TIC/TOC |  | DIG B | 1/1 | 9836 | 17 03 |  |  |
|------|-----------|---------|--|-------|-----|------|-------|--|--|

APPENDIX D  
STRIP CHART PAYLOAD SIGNATURES

APPENDIX D  
STRIP CHART PAYLOAD SIGNATURES

Figure D-1 is a strip chart (General Status 2) showing characteristic signatures of payload equipment. This record is made from a Narrowband tape recorder playback showing 22 frames of Wide Band Video tape recording. RBV, MSS, WBVTR-1 and WBVTR-2 were operating during this time period. The Wide Band Down Links were off. Increasing time is from right to left. The 17 pens are alternately analog and digital. The parameter values drawn by each pen are described below.

Pen #1 shows Greenwich Mean Time at the time of recording, as measured by the recording ground station. For example, the last time code, (left hand side) reads (binary):

01 0010 010 1001 000 0000 which converts to 12:29 digital.

Pen #2 shows spacecraft regulated bus current. The MSS is supplied from this bus. The first step-up (reading right to left) is the time of MSS turn-on. It reads 1.28 TMV (4.57 amps) before turn-on and 1.76 TMV (6.19 amps) after turn-on, the delta 1.62 amps being the MSS current demand.

Pen #3 shows two digital functions, the short duration function being MSS System ON, and the long duration function being Hi Voltage ON. (The elevated region is ON.) The non-coincidence in time between this Pen and Pen #2 is due to the sequential sampling format.

Pen #4 again shows duplexed functions, both relating to the Wide Band Power Amplifier No. 1. The bottom horizontal lines (reading zero, showing the WBPA was OFF) show the voltage of the +15 V A supply; and the top horizontal lines (reading 2.0 TMV equal to 17.0<sup>o</sup>C) show the temperature of the collector.

Pen #5 shows the duplexed functions of RBV 24 Volts ON and RBV Shutter Power ON.

Pen #6 is similar to Pen #4 except it shows the parameters for WBPA No. 2 which is normally associated with the MSS.

Pen #7 shows duplexed function for RBV Magnetic Compensator ON and CCC Power ON.

Pen #8 shows the duplexed functions of Wideband Video Tape Recorder footages, the top horizontal lines associated with WBVTR-1 and the bottom lines with WBVTR-2. At the beginning of the RECORD session, the footage read 2.23 TMV (equal to 10.03 Min) for WBVTR-1 and 2.77 TMV (equal to 16.63 Min) for WBVTR-2. At the end, the corresponding footages are 20.43 min for WBVTR-1, and 25.79 min. for WBVTR-2.

Pen #9 shows whether WBVTR-1 is in Rewind. It reads zero (depressed) showing that WBVTR-1 is not in the Rewind mode.

Pen #10 shows WBVTR-1 input current. At Record Command, the current rose to 3.95 TMV (equal to 3.59 amps) after a brief saturation transient in excess of 8.18 amps. This transient is a characteristic signature of WBVTR turn-ON.

Pen #11 is duplexed to show Record and Playback modes. Because of the fast run time of the strip recorder, the brief interval between sampling and the mode displayed, the line blurred, making reading impossible.

Pen #12 duplexes the reflected power in the antenna systems of WBPA 1 and 2. Because both these systems were OFF, the readings are zero.

Pen #13 shows whether WBVTR-2 was in Standby or Rewind mode. It can be seen the top horizontal segment went to zero at start of record, terminating the Standby mode.

Pen #14 shows the Payload Regulated bus current, with its easily recognizable characteristic signature of RBV and WBVTR activity. After turn-on and warm-up, the WBVTR's can be seen suddenly increasing the current drain and producing characteristic WBVTR turn-on transient, WBVTR-2 first followed immediately by WBVTR-1. 22 RBV camera exposures and readouts can be seen. During this interval, it can be seen from Pen #8, that the scenes are being recorded on the moving tape. Turn-OFF is seen to be simultaneous for RBV, MSS and both video tape recorders.

Pen #15 shows whether WBVTR-2 is in Record or Playback mode. Again the fast speed of the strip chart and the proximity of sampling times obscures the message.

Pen #16 is identical to Pen #10 showing Recorder Input Current except that it relates to WBVTR-2. It can be seen that Recorder 2 comes on before Recorder 1.

Pen #17 shows GMT as measured in the Spacecraft at the time of data sampling.



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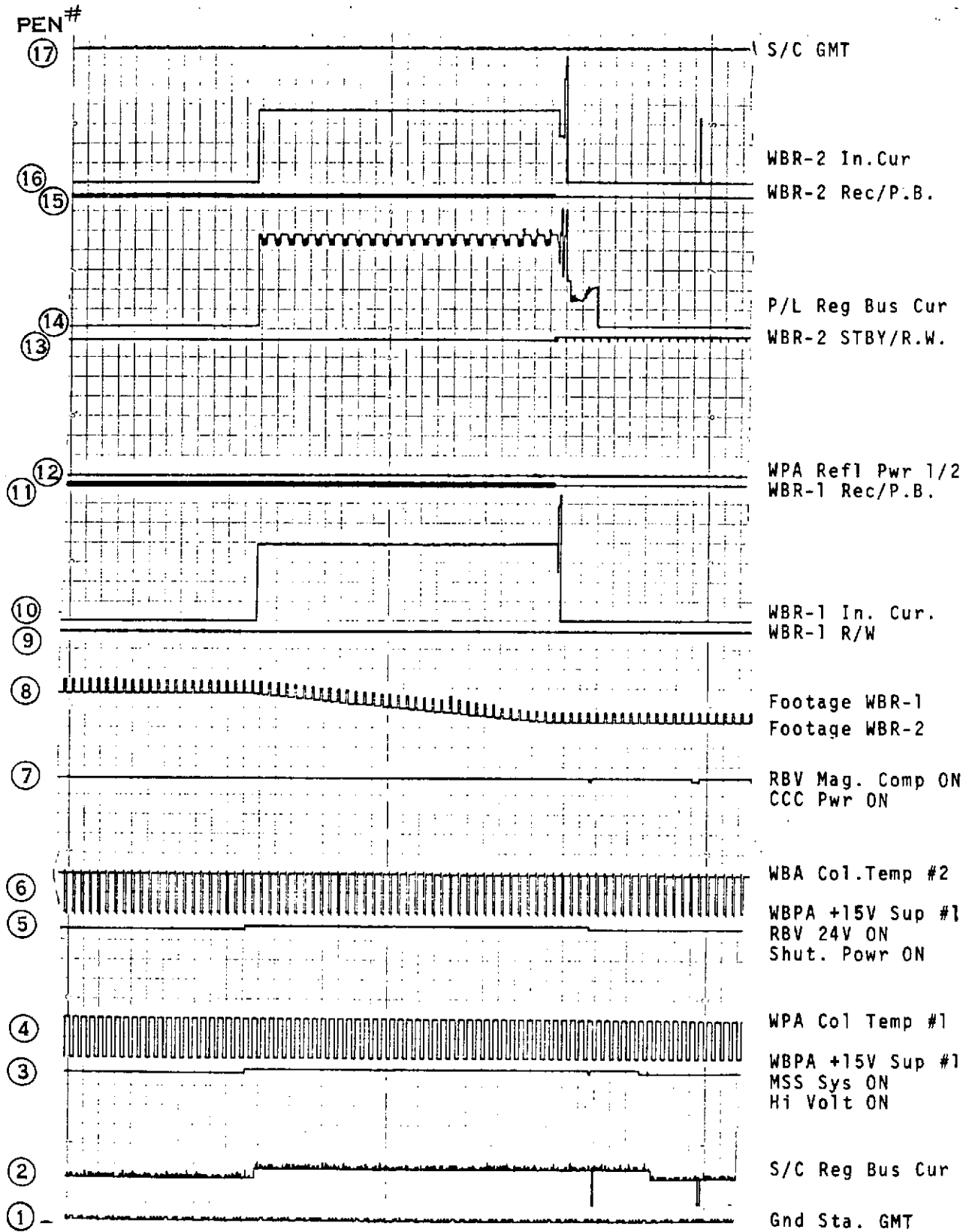


Figure D-1. Characteristic Strip Chart Payload Signatures

**APPENDIX E**  
**MSS PHOTOGRAPHS**

APPENDIX E  
MSS PHOTOGRAPHS

Representative imagery from the MSS is shown in the following figures. Spectral bands are given in Table E-1.

Table E-1. MSS Imagery

| Figure | Band       | Wavelength<br>(Microns) | System |
|--------|------------|-------------------------|--------|
| E-1    | 1          | (0.5 - 0.6)             | MSS    |
| E-2    | 2          | (0.6 - 0.7)             | MSS    |
| E-3    | 3          | (0.7 - 0.8)             | MSS    |
| E-4    | 4          | (0.8 - 1.1)             | MSS    |
| E-5    | 4, 5 and 7 | (*B&W Composite)        | MSS    |

\*B&W Composites of MSS use three bands - 4, 5 and 7; or 4, 6 and 7.

Note: Band Imagery is annotated MSS 4, 5, 6, 7, and 457 (composite).

All photographs show the same ground scene, 185 x 185 square kilometers in area. The scene covers a segment of the California coast from Monterey (bottom center) to Napa (top edge near left). The Golden Gate just above San Francisco is at upper left. Stockton is located just under circular break in clouds (right of center, just below top). Clouds cover the San Joaquin Valley. Sacramento is 30 miles to north of picture center. Pacific Ocean is at lower left. San Pablo Bay and San Francisco Bay are clearly visible near San Francisco, and at lower right San Luis Reservoir is seen. Water pollution is seen in San Francisco Bay, intense near Oakland International Airport and stretching across the Bay to near San Francisco International Airport.

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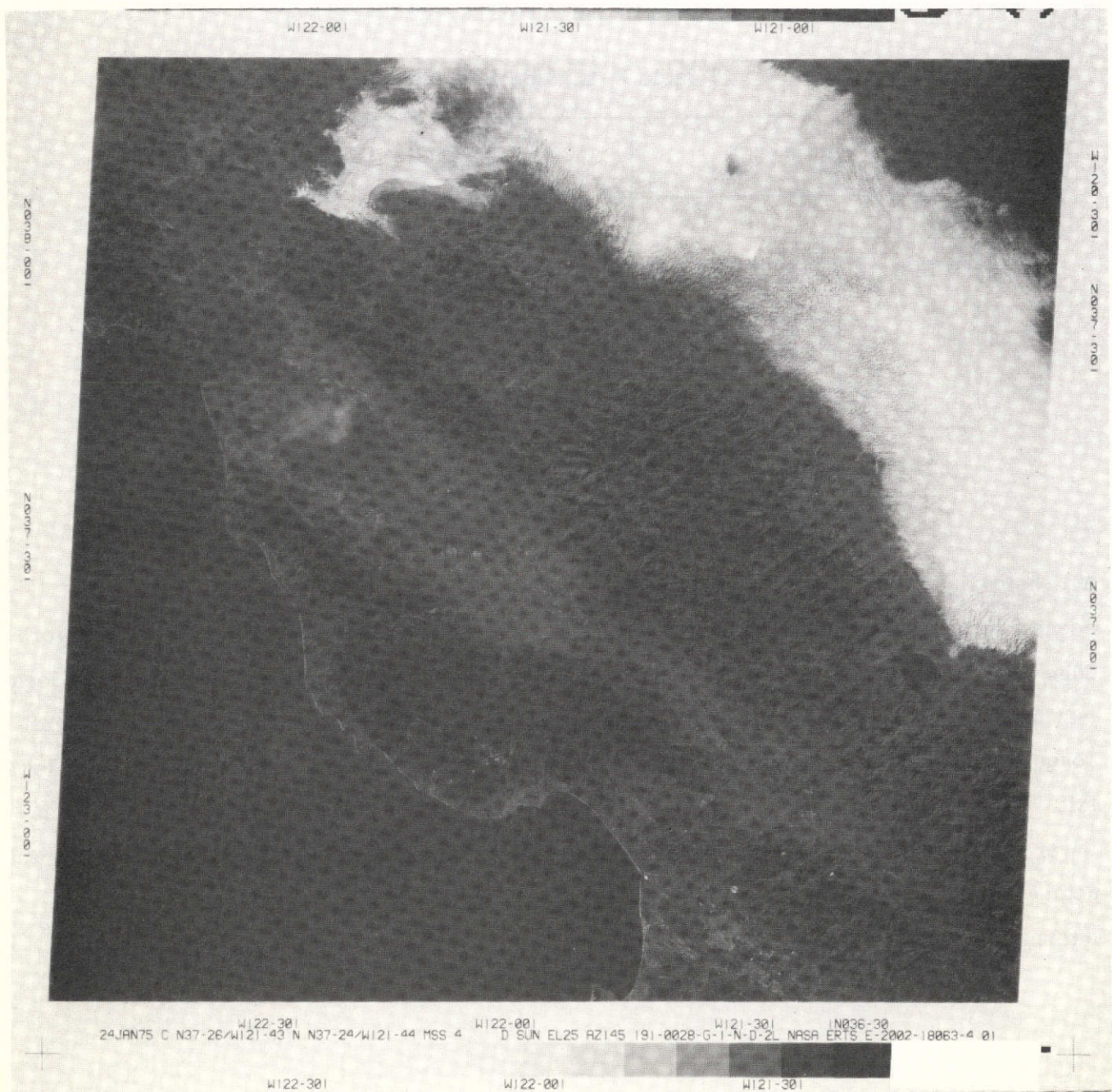


Figure E-1.

07  
71 E0

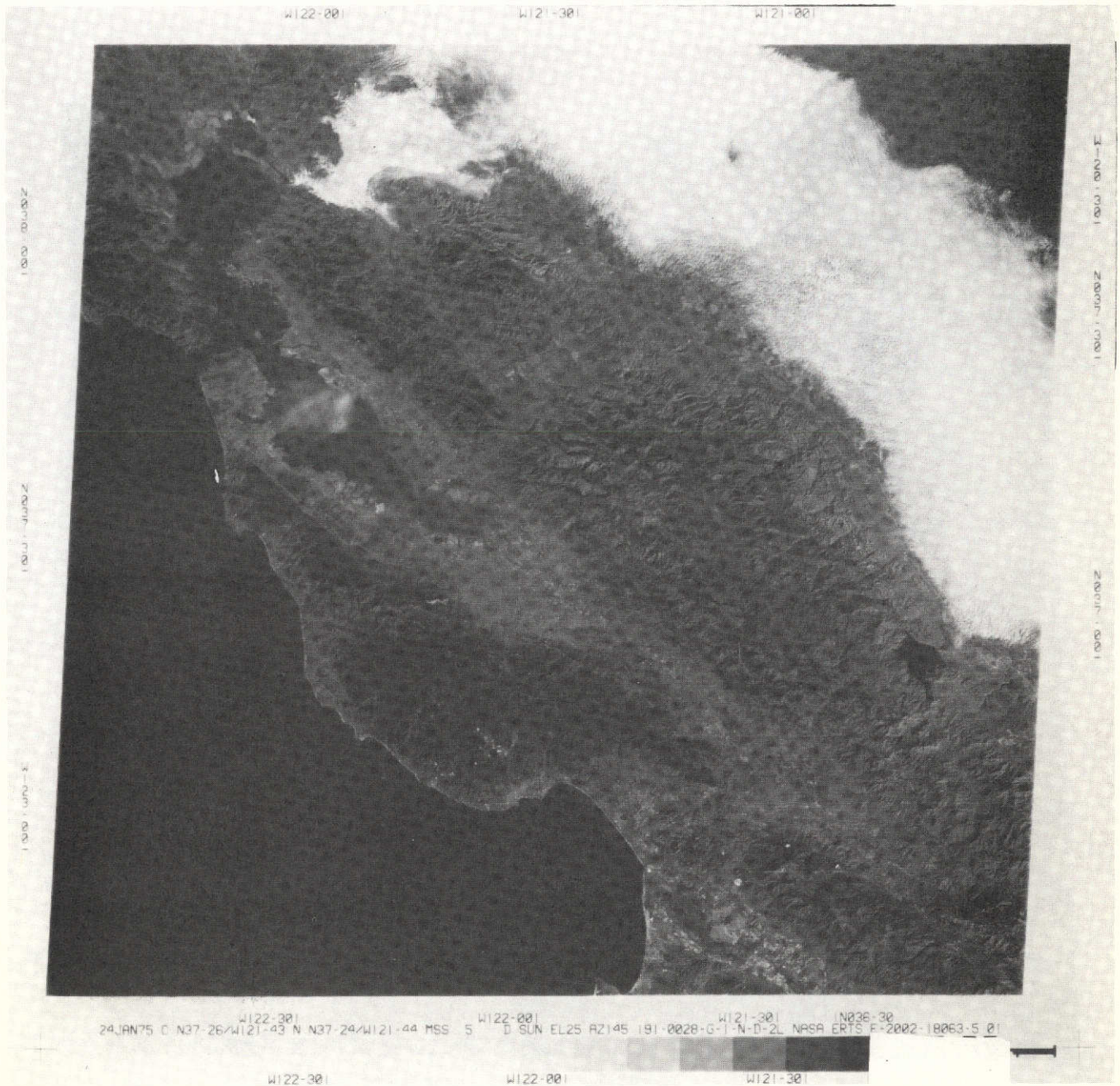


Figure E-2.

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Figure E-3.

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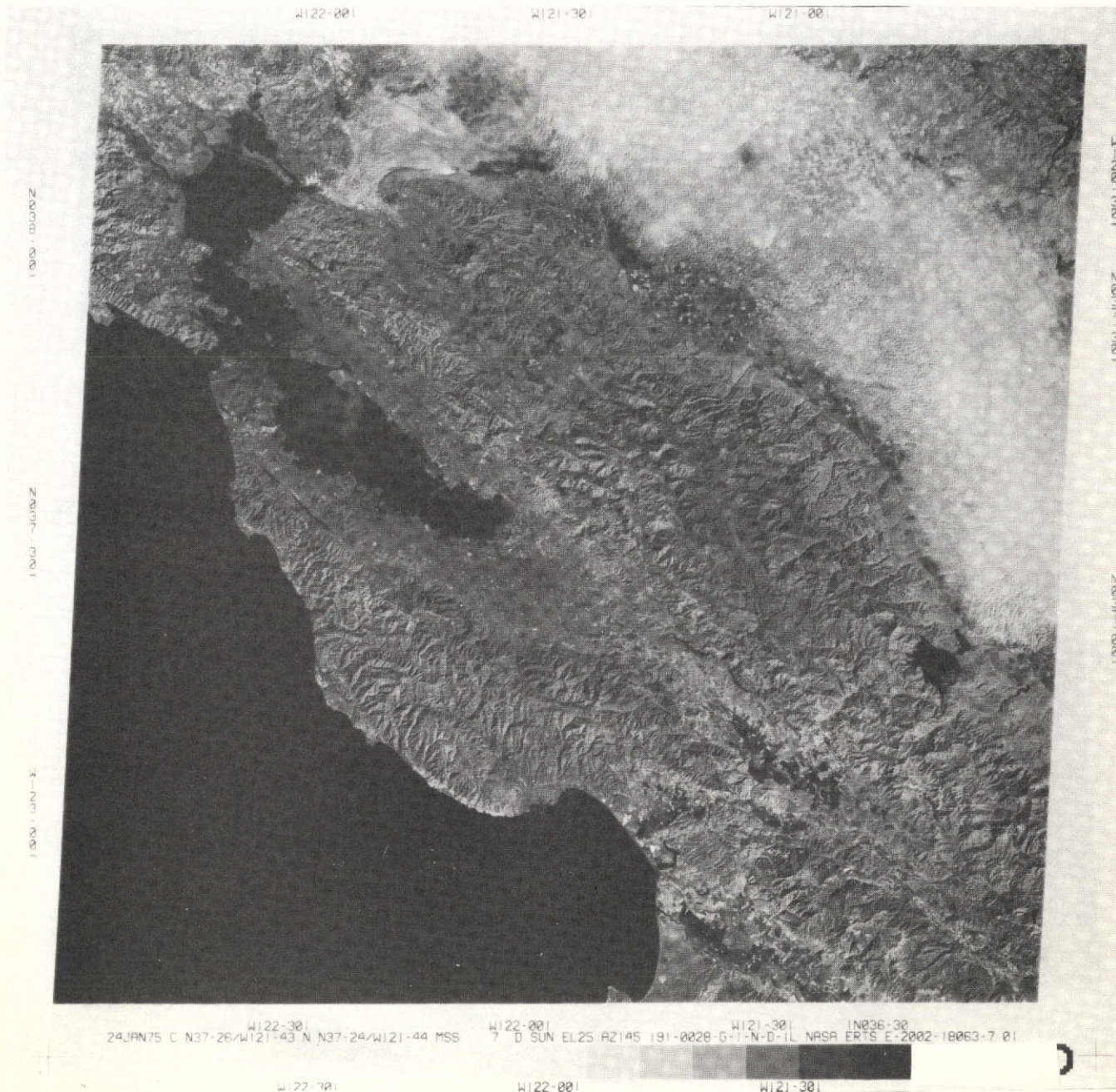


Figure E-4.

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Figure E-5.



APPENDIX F  
PIR U-1N23-ERTS-130  
DCS OPERATIONS IN LANDSAT 2

|  |           |         |              |           |
|--|-----------|---------|--------------|-----------|
| CLASS. LTR.                                      | OPERATION | PROGRAM | SEQUENCE NO. | REV. LTR. |
| PIR NO. U  | — 1N23    | — ERTS  | — 130        |           |
| *USE "C" FOR CLASSIFIED AND "U" FOR UNCLASSIFIED |           |         |              |           |

**PROGRAM INFORMATION REQUEST / RELEASE**

|                                      |                              |                      |                    |
|--------------------------------------|------------------------------|----------------------|--------------------|
| FROM<br><b>K.S. Rizk</b>             | TO<br><b>T.W. Winchester</b> |                      |                    |
| DATE SENT<br><b>12 February 1975</b> | DATE INFO. REQUIRED          | PROJECT AND REQ. NO. | REFERENCE DIR. NO. |

SUBJECT  
**DCS Operations in LANDSAT-2**

**INFORMATION REQUESTED/RELEASED**

INTRODUCTION

The Data Collection Subsystem (DCS) was turned off in LANDSAT-1 after orbit 12690 on January 19, 1975, and has remained off ever since. In LANDSAT-2 the DCS was turned on in orbit 5 on January 22, 1975, and has remained on since. This study is to compare the effectiveness of the system before and after the changeover.

SUMMARY

The effectiveness of the Data Collection System is at least as good with LANDSAT-2 as with LANDSAT-1.

DISCUSSION

Using a data span from a month before the launch of LANDSAT-2 to the present, it is possible to plot the continuity and trend of DCS messages received in OCC. With this data it is possible to compare the effectiveness of the DCS in LANDSAT-1 with that in LANDSAT-2.

Figure 1 shows the number of DCS messages received daily at OCC, and the number of active platforms each day.

Despite a substantial decrease in the number of active platforms since LANDSAT-2 assumed DCS operations, the total number of messages received has remained substantially the same. The sinusoidal effect of orbital drift on the earth's surface during the 18-day cycle is apparent in Figure 1 for both LANDSAT-1 and LANDSAT-2.

In order to provide a more equitable comparison, a plot was made in Figure 2 of the messages per day per platform. From this it can be seen that the Data Collection System using LANDSAT-2 is at least as effective as that using LANDSAT-1.

The data in Figures 1 and 2 permit an examination of 1-station versus 2-station operation. In the first 3 days, the Greenbelt DCS ground station equipment was inoperative leaving only the Goldstone station to receive messages. In that period about 610 messages were received daily, about 6.5 messages per day per platform. At a time 18 days later, when the orbital ground traces on the earth were the same, both stations were operating. The daily message count was then about 930, about 9 messages per day per platform.

From Figure 2, the average number of messages received per day per platform is about 10 for LANDSAT-1 and about 11 for LANDSAT-2.

*K.S. Rizk*

K.S. Rizk, Systems Engineer

|        |            |               |
|--------|------------|---------------|
| Dist.: | B. Phucas  | L. Gonzales   |
|        | H. Boys    | L. Smith      |
|        | Oper Supr. | J. Seitner    |
|        | R. Devlin  | K. Rizk (4)   |
|        | E. Painter | J. Williamson |

PAGE NO.

RETENTION REQUIREMENTS

COPIES FOR      MASTERS FOR

1 MO.       3 MOS.

3 MOS.       6 MOS.

6 MOS.       12 MOS.

MOS.       YRS.

      DON'T DESTROY

OF

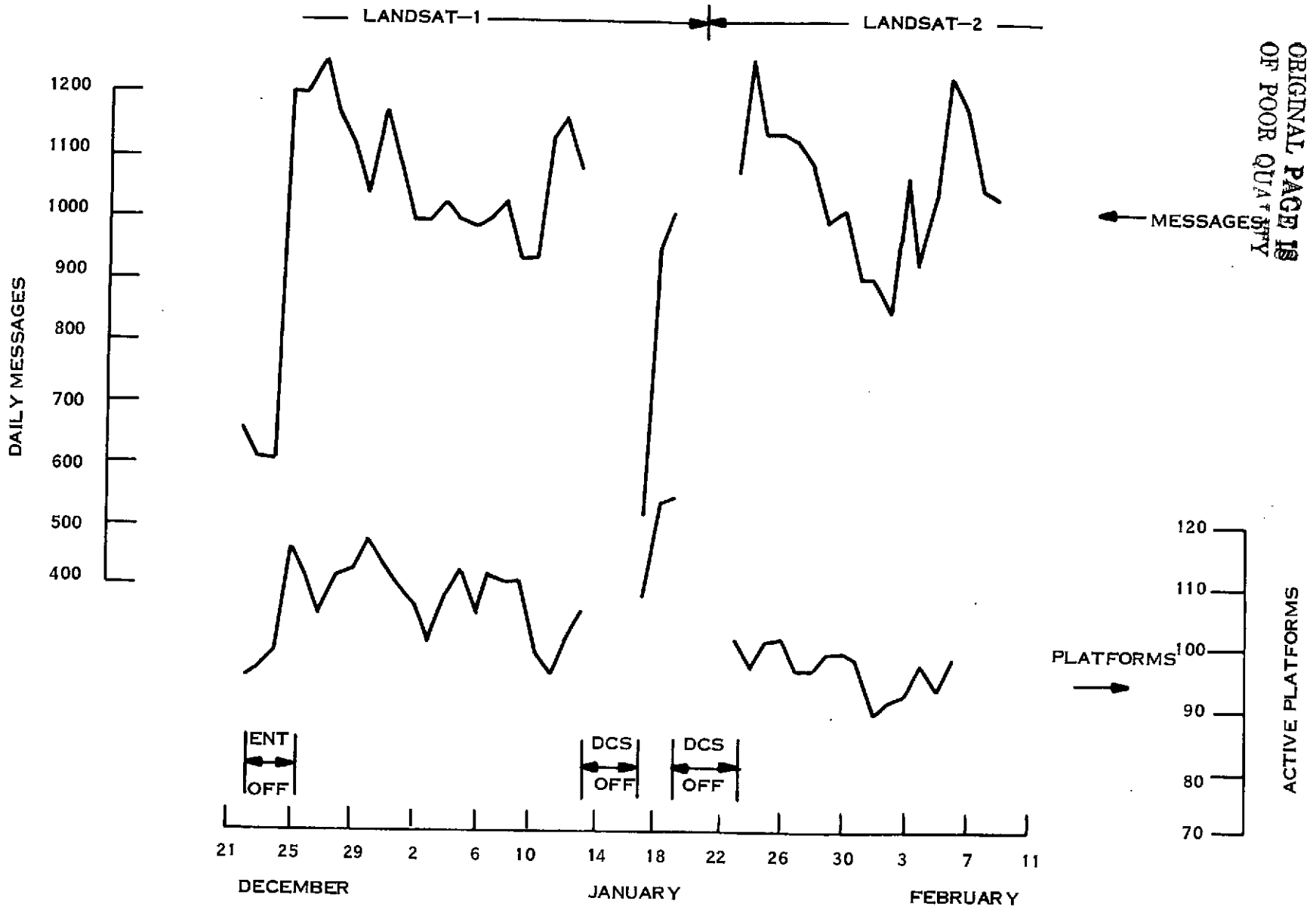


Figure 1. Data Collection System Performance

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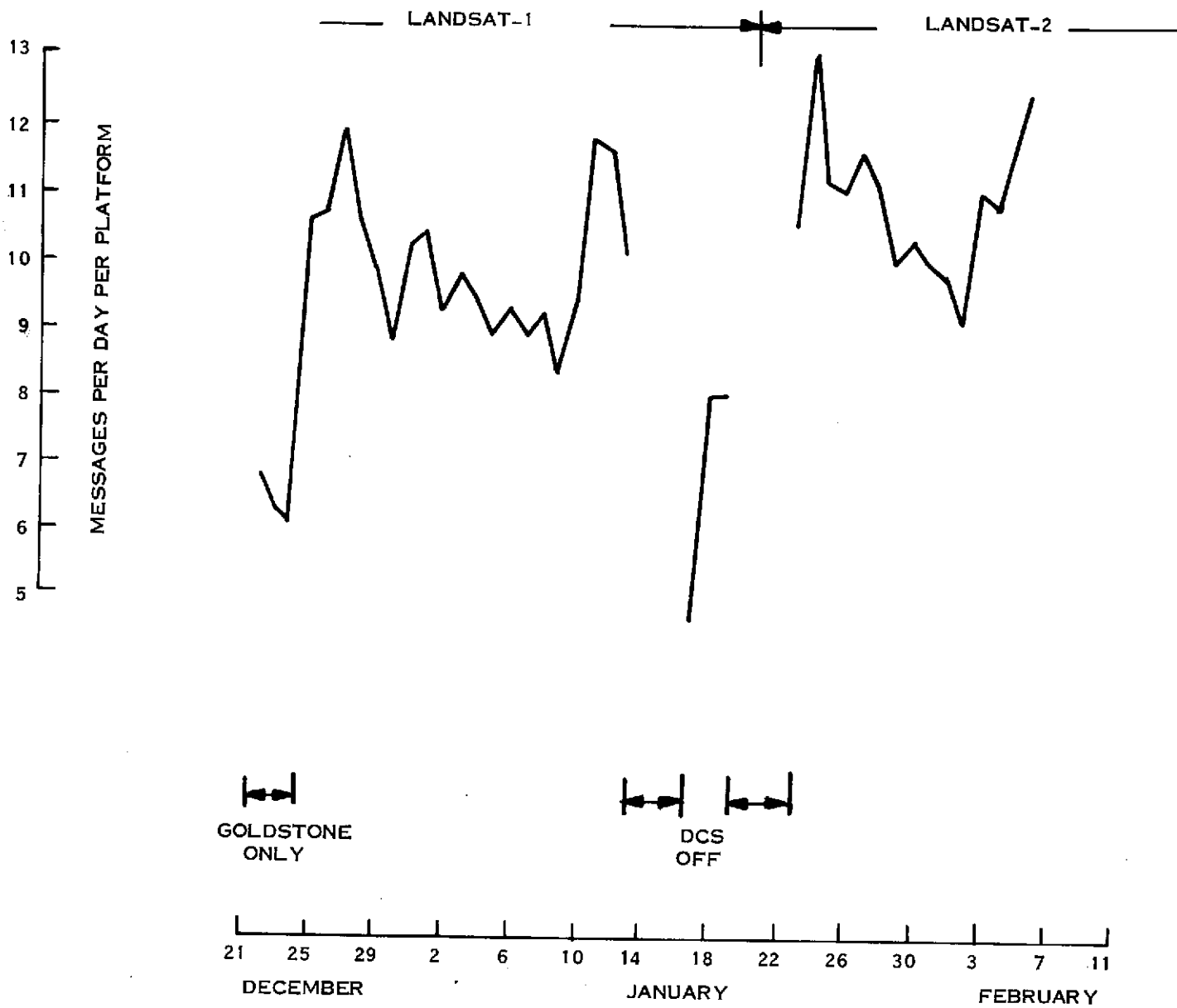


Figure 2. DCS Normalized Performance

**APPENDIX G**  
**SPACECRAFT ORBIT REFERENCE TABLES**

LANDSAT-2

SPACECRAFT ORBIT REFERENCE TABLES  
FROM JANUARY 1975 THROUGH DECEMBER 1975  
ORBITS 0 THROUGH 16123  
FLIGHT DAY 0 THROUGH 1156



LANDSAT-2

FEB, 1975

| DATE | GMI DAY | FLIGHT DAY | SPACECRAFT ORBITS | REFERENCE ORBITS | REF DAY | CYCLE NO. |
|------|---------|------------|-------------------|------------------|---------|-----------|
| 1    | 32      | 10         | 130 - 131         | 43 - 44          | 4       | 0         |
|      | 32      | 10         | 132 - 143         | 59 - 70          | 5       | 0         |
| 2    | 33      | 11         | 144 - 157         | 71 - 84          | 6       | 0         |
| 3    | 34      | 12         | 158 - 167         | 85 - 94          | 7       | 0         |
|      | 34      | 12         | 168 - 171         | 109 - 112        | 8       | 0         |
| 4    | 35      | 13         | 172 - 185         | 113 - 126        | 9       | 0         |
| 5    | 36      | 14         | 186 - 198         | 127 - 139        | 10      | 0         |
| 6    | 37      | 15         | 199 - 212         | 140 - 153        | 11      | 0         |
| 7    | 38      | 16         | 213 - 226         | 154 - 167        | 12      | 0         |
| 8    | 39      | 17         | 227 - 240         | 168 - 181        | 13      | 0         |
| 9    | 40      | 18         | 241 - 254         | 182 - 195        | 14      | 0         |
| 10   | 41      | 19         | 255 - 268         | 196 - 209        | 15      | 0         |
| 11   | 42      | 20         | 269 - 282         | 210 - 223        | 16      | 0         |
| 12   | 43      | 21         | 283 - 296         | 224 - 237        | 17      | 0         |
| 13   | 44      | 22         | 297 - 310         | 238 - 251        | 18      | 0         |
| 14   | 45      | 23         | 311 - 324         | 1 - 14           | 1       | 1         |
| 15   | 46      | 24         | 325 - 338         | 15 - 28          | 2       | 1         |
| 16   | 47      | 25         | 339 - 352         | 29 - 42          | 3       | 1         |
| 17   | 48      | 26         | 353 - 366         | 43 - 56          | 4       | 1         |
| 18   | 49      | 27         | 367 - 380         | 57 - 70          | 5       | 1         |
| 19   | 50      | 28         | 381 - 394         | 71 - 84          | 6       | 1         |
| 20   | 51      | 29         | 395 - 408         | 85 - 98          | 7       | 1         |
| 21   | 52      | 30         | 409 - 422         | 99 - 112         | 8       | 1         |
| 22   | 53      | 31         | 423 - 436         | 113 - 126        | 9       | 1         |
| 23   | 54      | 32         | 437 - 449         | 127 - 139        | 10      | 1         |
| 24   | 55      | 33         | 450 - 463         | 140 - 153        | 11      | 1         |
| 25   | 56      | 34         | 464 - 477         | 154 - 167        | 12      | 1         |
| 26   | 57      | 35         | 478 - 491         | 168 - 181        | 13      | 1         |
| 27   | 58      | 36         | 492 - 505         | 182 - 195        | 14      | 1         |
| 28   | 59      | 37         | 506 - 519         | 196 - 209        | 15      | 1         |

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LANDSAT-2

MAR, 1975

| DATE | GMT DAY | FLIGHT DAY | SPACECRAFT ORBITS | REFERENCE ORBITS | REF DAY | CYCLE NB. |
|------|---------|------------|-------------------|------------------|---------|-----------|
| 1    | 60      | 38         | 520- 533          | 210-223          | 16      | 1         |
| 2    | 61      | 39         | 534- 547          | 224-237          | 17      | 1         |
| 3    | 62      | 40         | 548- 561          | 238-251          | 18      | 1         |
| 4    | 63      | 41         | 562- 575          | 1- 14            | 1       | 2         |
| 5    | 64      | 42         | 576- 589          | 15- 28           | 2       | 2         |
| 6    | 65      | 43         | 590- 603          | 29- 42           | 3       | 2         |
| 7    | 66      | 44         | 604- 617          | 43- 56           | 4       | 2         |
| 8    | 67      | 45         | 618- 631          | 57- 70           | 5       | 2         |
| 9    | 68      | 46         | 632- 645          | 71- 84           | 6       | 2         |
| 10   | 69      | 47         | 646- 659          | 85- 98           | 7       | 2         |
| 11   | 70      | 48         | 660- 673          | 99-112           | 8       | 2         |
| 12   | 71      | 49         | 674- 687          | 113-126          | 9       | 2         |
| 13   | 72      | 50         | 688- 700          | 127-139          | 10      | 2         |
| 14   | 73      | 51         | 701- 714          | 140-153          | 11      | 2         |
| 15   | 74      | 52         | 715- 728          | 154-167          | 12      | 2         |
| 16   | 75      | 53         | 729- 742          | 168-181          | 13      | 2         |
| 17   | 76      | 54         | 743- 756          | 182-195          | 14      | 2         |
| 18   | 77      | 55         | 757- 770          | 196-209          | 15      | 2         |
| 19   | 78      | 56         | 771- 784          | 210-223          | 16      | 2         |
| 20   | 79      | 57         | 785- 798          | 224-237          | 17      | 2         |
| 21   | 80      | 58         | 799- 812          | 238-251          | 18      | 2         |
| 22   | 81      | 59         | 813- 826          | 1- 14            | 1       | 3         |
| 23   | 82      | 60         | 827- 840          | 15- 28           | 2       | 3         |
| 24   | 83      | 61         | 841- 854          | 29- 42           | 3       | 3         |
| 25   | 84      | 62         | 855- 868          | 43- 56           | 4       | 3         |
| 26   | 85      | 63         | 869- 882          | 57- 70           | 5       | 3         |
| 27   | 86      | 64         | 883- 896          | 71- 84           | 6       | 3         |
| 28   | 87      | 65         | 897- 910          | 85- 98           | 7       | 3         |
| 29   | 88      | 66         | 911- 924          | 99-112           | 8       | 3         |
| 30   | 89      | 67         | 925- 938          | 113-126          | 9       | 3         |
| 31   | 90      | 68         | 939- 951          | 127-139          | 10      | 3         |

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LANDSAT-2

APR, 1975

| DATE | GMT DAY | FLIGHT DAY | SPACECRAFT ORBITS | REFERENCE ORBITS | REF DAY | CYCLE NO. |
|------|---------|------------|-------------------|------------------|---------|-----------|
| 1    | 91      | 69         | 952- 965          | 140-153          | 11      | 3         |
| 2    | 92      | 70         | 966- 979          | 154-167          | 12      | 3         |
| 3    | 93      | 71         | 980- 993          | 168-181          | 13      | 3         |
| 4    | 94      | 72         | 994- 1007         | 182-195          | 14      | 3         |
| 5    | 95      | 73         | 1008- 1021        | 196-209          | 15      | 3         |
| 6    | 96      | 74         | 1022- 1035        | 210-223          | 16      | 3         |
| 7    | 97      | 75         | 1036- 1049        | 224-237          | 17      | 3         |
| 8    | 98      | 76         | 1050- 1063        | 238-251          | 18      | 3         |
| 9    | 99      | 77         | 1064- 1077        | 1- 14            | 1       | 4         |
| 10   | 100     | 78         | 1078- 1091        | 15- 28           | 2       | 4         |
| 11   | 101     | 79         | 1092- 1105        | 29- 42           | 3       | 4         |
| 12   | 102     | 80         | 1106- 1119        | 43- 56           | 4       | 4         |
| 13   | 103     | 81         | 1120- 1133        | 57- 70           | 5       | 4         |
| 14   | 104     | 82         | 1134- 1147        | 71- 84           | 6       | 4         |
| 15   | 105     | 83         | 1148- 1161        | 85- 98           | 7       | 4         |
| 16   | 106     | 84         | 1162- 1175        | 99-112           | 8       | 4         |
| 17   | 107     | 85         | 1176- 1189        | 113-126          | 9       | 4         |
| 18   | 108     | 86         | 1190- 1202        | 127-139          | 10      | 4         |
| 19   | 109     | 87         | 1203- 1216        | 140-153          | 11      | 4         |
| 20   | 110     | 88         | 1217- 1230        | 154-167          | 12      | 4         |
| 21   | 111     | 89         | 1231- 1244        | 168-181          | 13      | 4         |
| 22   | 112     | 90         | 1245- 1258        | 182-195          | 14      | 4         |
| 23   | 113     | 91         | 1259- 1272        | 196-209          | 15      | 4         |
| 24   | 114     | 92         | 1273- 1286        | 210-223          | 16      | 4         |
| 25   | 115     | 93         | 1287- 1300        | 224-237          | 17      | 4         |
| 26   | 116     | 94         | 1301- 1314        | 238-251          | 18      | 4         |
| 27   | 117     | 95         | 1315- 1328        | 1- 14            | 1       | 5         |
| 28   | 118     | 96         | 1329- 1342        | 15- 28           | 2       | 5         |
| 29   | 119     | 97         | 1343- 1356        | 29- 42           | 3       | 5         |
| 30   | 120     | 98         | 1357- 1370        | 43- 56           | 4       | 5         |

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## LANDSAT-2

MAY, 1975

| DATE | GMT DAY | FLIGHT DAY | SPACECRAFT ORBITS | REFERENCE ORBITS | REF DAY | CYCLE NB. |
|------|---------|------------|-------------------|------------------|---------|-----------|
| 1    | 121     | 99         | 1371-1384         | 57-70            | 5       | 5         |
| 2    | 122     | 100        | 1385-1398         | 71-84            | 6       | 5         |
| 3    | 123     | 101        | 1399-1412         | 85-98            | 7       | 5         |
| 4    | 124     | 102        | 1413-1426         | 99-112           | 8       | 5         |
| 5    | 125     | 103        | 1427-1440         | 113-126          | 9       | 5         |
| 6    | 126     | 104        | 1441-1453         | 127-139          | 10      | 5         |
| 7    | 127     | 105        | 1454-1467         | 140-153          | 11      | 5         |
| 8    | 128     | 106        | 1468-1481         | 154-167          | 12      | 5         |
| 9    | 129     | 107        | 1482-1495         | 168-181          | 13      | 5         |
| 10   | 130     | 108        | 1496-1509         | 182-195          | 14      | 5         |
| 11   | 131     | 109        | 1510-1523         | 196-209          | 15      | 5         |
| 12   | 132     | 110        | 1524-1537         | 210-223          | 16      | 5         |
| 13   | 133     | 111        | 1538-1551         | 224-237          | 17      | 5         |
| 14   | 134     | 112        | 1552-1565         | 238-251          | 18      | 5         |
| 15   | 135     | 113        | 1566-1579         | 1-14             | 1       | 6         |
| 16   | 136     | 114        | 1580-1593         | 15-28            | 2       | 6         |
| 17   | 137     | 115        | 1594-1607         | 29-42            | 3       | 6         |
| 18   | 138     | 116        | 1608-1621         | 43-56            | 4       | 6         |
| 19   | 139     | 117        | 1622-1635         | 57-70            | 5       | 6         |
| 20   | 140     | 118        | 1636-1649         | 71-84            | 6       | 6         |
| 21   | 141     | 119        | 1650-1663         | 85-98            | 7       | 6         |
| 22   | 142     | 120        | 1664-1677         | 99-112           | 8       | 6         |
| 23   | 143     | 121        | 1678-1691         | 113-126          | 9       | 6         |
| 24   | 144     | 122        | 1692-1704         | 127-139          | 10      | 6         |
| 25   | 145     | 123        | 1705-1718         | 140-153          | 11      | 6         |
| 26   | 146     | 124        | 1719-1732         | 154-167          | 12      | 6         |
| 27   | 147     | 125        | 1733-1746         | 168-181          | 13      | 6         |
| 28   | 148     | 126        | 1747-1760         | 182-195          | 14      | 6         |
| 29   | 149     | 127        | 1761-1774         | 196-209          | 15      | 6         |
| 30   | 150     | 128        | 1775-1788         | 210-223          | 16      | 6         |
| 31   | 151     | 129        | 1789-1802         | 224-237          | 17      | 6         |

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JUN, 1975

| DATE | GMT DAY | FLIGHT DAY | SPACECRAFT ORBITS | REFERENCE ORBITS | REF DAY | CYCLE NO. |
|------|---------|------------|-------------------|------------------|---------|-----------|
| 1    | 152     | 130        | 1803-1816         | 238-251          | 18      | 6         |
| 2    | 153     | 131        | 1817-1830         | 1-14             | 1       | 7         |
| 3    | 154     | 132        | 1831-1844         | 15-28            | 2       | 7         |
| 4    | 155     | 133        | 1845-1858         | 29-42            | 3       | 7         |
| 5    | 156     | 134        | 1859-1872         | 43-56            | 4       | 7         |
| 6    | 157     | 135        | 1873-1886         | 57-70            | 5       | 7         |
| 7    | 158     | 136        | 1887-1900         | 71-84            | 6       | 7         |
| 8    | 159     | 137        | 1901-1914         | 85-98            | 7       | 7         |
| 9    | 160     | 138        | 1915-1928         | 99-112           | 8       | 7         |
| 10   | 161     | 139        | 1929-1942         | 113-126          | 9       | 7         |
| 11   | 162     | 140        | 1943-1955         | 127-139          | 10      | 7         |
| 12   | 163     | 141        | 1956-1969         | 140-153          | 11      | 7         |
| 13   | 164     | 142        | 1970-1983         | 154-167          | 12      | 7         |
| 14   | 165     | 143        | 1984-1997         | 168-181          | 13      | 7         |
| 15   | 166     | 144        | 1998-2011         | 182-195          | 14      | 7         |
| 16   | 167     | 145        | 2012-2025         | 196-209          | 15      | 7         |
| 17   | 168     | 146        | 2026-2039         | 210-223          | 16      | 7         |
| 18   | 169     | 147        | 2040-2053         | 224-237          | 17      | 7         |
| 19   | 170     | 148        | 2054-2067         | 238-251          | 18      | 7         |
| 20   | 171     | 149        | 2068-2081         | 1-14             | 1       | 8         |
| 21   | 172     | 150        | 2082-2095         | 15-28            | 2       | 8         |
| 22   | 173     | 151        | 2096-2109         | 29-42            | 3       | 8         |
| 23   | 174     | 152        | 2110-2123         | 43-56            | 4       | 8         |
| 24   | 175     | 153        | 2124-2137         | 57-70            | 5       | 8         |
| 25   | 176     | 154        | 2138-2151         | 71-84            | 6       | 8         |
| 26   | 177     | 155        | 2152-2165         | 85-98            | 7       | 8         |
| 27   | 178     | 156        | 2166-2179         | 99-112           | 8       | 8         |
| 28   | 179     | 157        | 2180-2193         | 113-126          | 9       | 8         |
| 29   | 180     | 158        | 2194-2206         | 127-139          | 10      | 8         |
| 30   | 181     | 159        | 2207-2220         | 140-153          | 11      | 8         |

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JUL, 1975

| DATE | GMT DAY | FLIGHT DAY | SPACECRAFT ORBITS | REFERENCE ORBITS | REF DAY | CYCLE NO. |
|------|---------|------------|-------------------|------------------|---------|-----------|
| 1    | 182     | 160        | 2221- 2234        | 154-167          | 12      | 8         |
| 2    | 183     | 161        | 2235- 2248        | 168-181          | 13      | 8         |
| 3    | 184     | 162        | 2249- 2262        | 182-195          | 14      | 8         |
| 4    | 185     | 163        | 2263- 2276        | 196-209          | 15      | 8         |
| 5    | 186     | 164        | 2277- 2290        | 210-223          | 16      | 8         |
| 6    | 187     | 165        | 2291- 2304        | 224-237          | 17      | 8         |
| 7    | 188     | 166        | 2305- 2318        | 238-251          | 18      | 8         |
| 8    | 189     | 167        | 2319- 2332        | 1- 14            | 1       | 9         |
| 9    | 190     | 168        | 2333- 2346        | 15- 28           | 2       | 9         |
| 10   | 191     | 169        | 2347- 2360        | 29- 42           | 3       | 9         |
| 11   | 192     | 170        | 2361- 2374        | 43- 56           | 4       | 9         |
| 12   | 193     | 171        | 2375- 2388        | 57- 70           | 5       | 9         |
| 13   | 194     | 172        | 2389- 2402        | 71- 84           | 6       | 9         |
| 14   | 195     | 173        | 2403- 2416        | 85- 98           | 7       | 9         |
| 15   | 196     | 174        | 2417- 2430        | 99-112           | 8       | 9         |
| 16   | 197     | 175        | 2431- 2444        | 113-126          | 9       | 9         |
| 17   | 198     | 176        | 2445- 2457        | 127-139          | 10      | 9         |
| 18   | 199     | 177        | 2458- 2471        | 140-153          | 11      | 9         |
| 19   | 200     | 178        | 2472- 2485        | 154-167          | 12      | 9         |
| 20   | 201     | 179        | 2486- 2499        | 168-181          | 13      | 9         |
| 21   | 202     | 180        | 2500- 2513        | 182-195          | 14      | 9         |
| 22   | 203     | 181        | 2514- 2527        | 196-209          | 15      | 9         |
| 23   | 204     | 182        | 2528- 2541        | 210-223          | 16      | 9         |
| 24   | 205     | 183        | 2542- 2555        | 224-237          | 17      | 9         |
| 25   | 206     | 184        | 2556- 2569        | 238-251          | 18      | 9         |
| 26   | 207     | 185        | 2570- 2583        | 1- 14            | 1       | 10        |
| 27   | 208     | 186        | 2584- 2597        | 15- 28           | 2       | 10        |
| 28   | 209     | 187        | 2598- 2611        | 29- 42           | 3       | 10        |
| 29   | 210     | 188        | 2612- 2625        | 43- 56           | 4       | 10        |
| 30   | 211     | 189        | 2626- 2639        | 57- 70           | 5       | 10        |
| 31   | 212     | 190        | 2640- 2653        | 71- 84           | 6       | 10        |

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LANDSAT-2

AUG, 1975

| DATE | GMT DAY | FLIGHT DAY | SPACECRAFT ORBITS | REFERENCE ORBITS | REF DAY | CYCLE NO. |
|------|---------|------------|-------------------|------------------|---------|-----------|
| 1    | 213     | 191        | 2654-2667         | 85-98            | 7       | 10        |
| 2    | 214     | 192        | 2668-2681         | 99-112           | 8       | 10        |
| 3    | 215     | 193        | 2682-2695         | 113-126          | 9       | 10        |
| 4    | 216     | 194        | 2696-2708         | 127-139          | 10      | 10        |
| 5    | 217     | 195        | 2709-2722         | 140-153          | 11      | 10        |
| 6    | 218     | 196        | 2723-2736         | 154-167          | 12      | 10        |
| 7    | 219     | 197        | 2737-2750         | 168-181          | 13      | 10        |
| 8    | 220     | 198        | 2751-2764         | 182-195          | 14      | 10        |
| 9    | 221     | 199        | 2765-2778         | 196-209          | 15      | 10        |
| 10   | 222     | 200        | 2779-2792         | 210-223          | 16      | 10        |
| 11   | 223     | 201        | 2793-2806         | 224-237          | 17      | 10        |
| 12   | 224     | 202        | 2807-2820         | 238-251          | 18      | 10        |
| 13   | 225     | 203        | 2821-2834         | 1-14             | 1       | 11        |
| 14   | 226     | 204        | 2835-2848         | 15-28            | 2       | 11        |
| 15   | 227     | 205        | 2849-2862         | 29-42            | 3       | 11        |
| 16   | 228     | 206        | 2863-2876         | 43-56            | 4       | 11        |
| 17   | 229     | 207        | 2877-2890         | 57-70            | 5       | 11        |
| 18   | 230     | 208        | 2891-2904         | 71-84            | 6       | 11        |
| 19   | 231     | 209        | 2905-2918         | 85-98            | 7       | 11        |
| 20   | 232     | 210        | 2919-2932         | 99-112           | 8       | 11        |
| 21   | 233     | 211        | 2933-2946         | 113-126          | 9       | 11        |
| 22   | 234     | 212        | 2947-2959         | 127-139          | 10      | 11        |
| 23   | 235     | 213        | 2960-2973         | 140-153          | 11      | 11        |
| 24   | 236     | 214        | 2974-2987         | 154-167          | 12      | 11        |
| 25   | 237     | 215        | 2988-3001         | 168-181          | 13      | 11        |
| 26   | 238     | 216        | 3002-3015         | 182-195          | 14      | 11        |
| 27   | 239     | 217        | 3016-3029         | 196-209          | 15      | 11        |
| 28   | 240     | 218        | 3030-3043         | 210-223          | 16      | 11        |
| 29   | 241     | 219        | 3044-3057         | 224-237          | 17      | 11        |
| 30   | 242     | 220        | 3058-3071         | 238-251          | 18      | 11        |
| 31   | 243     | 221        | 3072-3085         | 1-14             | 1       | 12        |

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SEP, 1975

| DATE | GMT DAY | FLIGHT DAY | SPACECRAFT BRBITS | REFERENCE BRBITS | REF DAY | CYCLE NO. |
|------|---------|------------|-------------------|------------------|---------|-----------|
| 1    | 244     | 222        | 3086-3099         | 15-28            | 2       | 12        |
| 2    | 245     | 223        | 3100-3113         | 29-42            | 3       | 12        |
| 3    | 246     | 224        | 3114-3127         | 43-56            | 4       | 12        |
| 4    | 247     | 225        | 3128-3141         | 57-70            | 5       | 12        |
| 5    | 248     | 226        | 3142-3155         | 71-84            | 6       | 12        |
| 6    | 249     | 227        | 3156-3169         | 85-98            | 7       | 12        |
| 7    | 250     | 228        | 3170-3183         | 99-112           | 8       | 12        |
| 8    | 251     | 229        | 3184-3197         | 113-126          | 9       | 12        |
| 9    | 252     | 230        | 3198-3210         | 127-139          | 10      | 12        |
| 10   | 253     | 231        | 3211-3224         | 140-153          | 11      | 12        |
| 11   | 254     | 232        | 3225-3238         | 154-167          | 12      | 12        |
| 12   | 255     | 233        | 3239-3252         | 168-181          | 13      | 12        |
| 13   | 256     | 234        | 3253-3266         | 182-195          | 14      | 12        |
| 14   | 257     | 235        | 3267-3280         | 196-209          | 15      | 12        |
| 15   | 258     | 236        | 3281-3294         | 210-223          | 16      | 12        |
| 16   | 259     | 237        | 3295-3308         | 224-237          | 17      | 12        |
| 17   | 260     | 238        | 3309-3322         | 238-251          | 18      | 12        |
| 18   | 261     | 239        | 3323-3336         | 1-14             | 1       | 13        |
| 19   | 262     | 240        | 3337-3350         | 15-28            | 2       | 13        |
| 20   | 263     | 241        | 3351-3364         | 29-42            | 3       | 13        |
| 21   | 264     | 242        | 3365-3378         | 43-56            | 4       | 13        |
| 22   | 265     | 243        | 3379-3392         | 57-70            | 5       | 13        |
| 23   | 266     | 244        | 3393-3406         | 71-84            | 6       | 13        |
| 24   | 267     | 245        | 3407-3420         | 85-98            | 7       | 13        |
| 25   | 268     | 246        | 3421-3434         | 99-112           | 8       | 13        |
| 26   | 269     | 247        | 3435-3448         | 113-126          | 9       | 13        |
| 27   | 270     | 248        | 3449-3461         | 127-139          | 10      | 13        |
| 28   | 271     | 249        | 3462-3475         | 140-153          | 11      | 13        |
| 29   | 272     | 250        | 3476-3489         | 154-167          | 12      | 13        |
| 30   | 273     | 251        | 3490-3503         | 168-181          | 13      | 13        |

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## LANDSAT-2

OCT, 1975

| DATE | GMT DAY | FLIGHT DAY | SPACECRAFT ORBITS | REFERENCE ORBITS | REF DAY | CYCLE NO. |
|------|---------|------------|-------------------|------------------|---------|-----------|
| 1    | 274     | 252        | 3504-3517         | 182-195          | 14      | 13        |
| 2    | 275     | 253        | 3518-3531         | 196-209          | 15      | 13        |
| 3    | 276     | 254        | 3532-3545         | 210-223          | 16      | 13        |
| 4    | 277     | 255        | 3546-3559         | 224-237          | 17      | 13        |
| 5    | 278     | 256        | 3560-3573         | 238-251          | 18      | 13        |
| 6    | 279     | 257        | 3574-3587         | 1-14             | 1       | 14        |
| 7    | 280     | 258        | 3588-3601         | 15-28            | 2       | 14        |
| 8    | 281     | 259        | 3602-3615         | 29-42            | 3       | 14        |
| 9    | 282     | 260        | 3616-3629         | 43-56            | 4       | 14        |
| 10   | 283     | 261        | 3630-3643         | 57-70            | 5       | 14        |
| 11   | 284     | 262        | 3644-3657         | 71-84            | 6       | 14        |
| 12   | 285     | 263        | 3658-3671         | 85-98            | 7       | 14        |
| 13   | 286     | 264        | 3672-3685         | 99-112           | 8       | 14        |
| 14   | 287     | 265        | 3686-3699         | 113-126          | 9       | 14        |
| 15   | 288     | 266        | 3700-3712         | 127-139          | 10      | 14        |
| 16   | 289     | 267        | 3713-3726         | 140-153          | 11      | 14        |
| 17   | 290     | 268        | 3727-3740         | 154-167          | 12      | 14        |
| 18   | 291     | 269        | 3741-3754         | 168-181          | 13      | 14        |
| 19   | 292     | 270        | 3755-3768         | 182-195          | 14      | 14        |
| 20   | 293     | 271        | 3769-3782         | 196-209          | 15      | 14        |
| 21   | 294     | 272        | 3783-3796         | 210-223          | 16      | 14        |
| 22   | 295     | 273        | 3797-3810         | 224-237          | 17      | 14        |
| 23   | 296     | 274        | 3811-3824         | 238-251          | 18      | 14        |
| 24   | 297     | 275        | 3825-3838         | 1-14             | 1       | 15        |
| 25   | 298     | 276        | 3839-3852         | 15-28            | 2       | 15        |
| 26   | 299     | 277        | 3853-3866         | 29-42            | 3       | 15        |
| 27   | 300     | 278        | 3867-3880         | 43-56            | 4       | 15        |
| 28   | 301     | 279        | 3881-3894         | 57-70            | 5       | 15        |
| 29   | 302     | 280        | 3895-3908         | 71-84            | 6       | 15        |
| 30   | 303     | 281        | 3909-3922         | 85-98            | 7       | 15        |
| 31   | 304     | 282        | 3923-3936         | 99-112           | 8       | 15        |



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NOV, 1975

| DATE | GMT DAY | FLIGHT DAY | SPACECRAFT BRBITS | REFERENCE BRBITS | REF DAY | CYCLE NO. |
|------|---------|------------|-------------------|------------------|---------|-----------|
| 1    | 305     | 283        | 3937- 3950        | 113-126          | 9       | 15        |
| 2    | 306     | 284        | 3951- 3963        | 127-139          | 10      | 15        |
| 3    | 307     | 285        | 3964- 3977        | 140-153          | 11      | 15        |
| 4    | 308     | 286        | 3978- 3991        | 154-167          | 12      | 15        |
| 5    | 309     | 287        | 3992- 4005        | 168-181          | 13      | 15        |
| 6    | 310     | 288        | 4006- 4019        | 182-195          | 14      | 15        |
| 7    | 311     | 289        | 4020- 4033        | 196-209          | 15      | 15        |
| 8    | 312     | 290        | 4034- 4047        | 210-223          | 16      | 15        |
| 9    | 313     | 291        | 4048- 4061        | 224-237          | 17      | 15        |
| 10   | 314     | 292        | 4062- 4075        | 238-251          | 18      | 15        |
| 11   | 315     | 293        | 4076- 4089        | 1- 14            | 1       | 16        |
| 12   | 316     | 294        | 4090- 4103        | 15- 28           | 2       | 16        |
| 13   | 317     | 295        | 4104- 4117        | 29- 42           | 3       | 16        |
| 14   | 318     | 296        | 4118- 4131        | 43- 56           | 4       | 16        |
| 15   | 319     | 297        | 4132- 4145        | 57- 70           | 5       | 16        |
| 16   | 320     | 298        | 4146- 4159        | 71- 84           | 6       | 16        |
| 17   | 321     | 299        | 4160- 4173        | 85- 98           | 7       | 16        |
| 18   | 322     | 300        | 4174- 4187        | 99-112           | 8       | 16        |
| 19   | 323     | 301        | 4188- 4201        | 113-126          | 9       | 16        |
| 20   | 324     | 302        | 4202- 4214        | 127-139          | 10      | 16        |
| 21   | 325     | 303        | 4215- 4228        | 140-153          | 11      | 16        |
| 22   | 326     | 304        | 4229- 4242        | 154-167          | 12      | 16        |
| 23   | 327     | 305        | 4243- 4256        | 168-181          | 13      | 16        |
| 24   | 328     | 306        | 4257- 4270        | 182-195          | 14      | 16        |
| 25   | 329     | 307        | 4271- 4284        | 196-209          | 15      | 16        |
| 26   | 330     | 308        | 4285- 4298        | 210-223          | 16      | 16        |
| 27   | 331     | 309        | 4299- 4312        | 224-237          | 17      | 16        |
| 28   | 332     | 310        | 4313- 4326        | 238-251          | 18      | 16        |
| 29   | 333     | 311        | 4327- 4340        | 1- 14            | 1       | 17        |
| 30   | 334     | 312        | 4341- 4354        | 15- 28           | 2       | 17        |

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DEC, 1975

| DATE | GMT DAY | FLIGHT DAY | SPACECRAFT ORBITS | REFERENCE ORBITS | REF DAY | CYCLE NB. |
|------|---------|------------|-------------------|------------------|---------|-----------|
| 1    | 335     | 313        | 4355-4368         | 29-42            | 3       | 17        |
| 2    | 336     | 314        | 4369-4382         | 43-56            | 4       | 17        |
| 3    | 337     | 315        | 4383-4396         | 57-70            | 5       | 17        |
| 4    | 338     | 316        | 4397-4410         | 71-84            | 6       | 17        |
| 5    | 339     | 317        | 4411-4424         | 85-98            | 7       | 17        |
| 6    | 340     | 318        | 4425-4438         | 99-112           | 8       | 17        |
| 7    | 341     | 319        | 4439-4452         | 113-126          | 9       | 17        |
| 8    | 342     | 320        | 4453-4465         | 127-139          | 10      | 17        |
| 9    | 343     | 321        | 4466-4479         | 140-153          | 11      | 17        |
| 10   | 344     | 322        | 4480-4493         | 154-167          | 12      | 17        |
| 11   | 345     | 323        | 4494-4507         | 168-181          | 13      | 17        |
| 12   | 346     | 324        | 4508-4521         | 182-195          | 14      | 17        |
| 13   | 347     | 325        | 4522-4535         | 196-209          | 15      | 17        |
| 14   | 348     | 326        | 4536-4549         | 210-223          | 16      | 17        |
| 15   | 349     | 327        | 4550-4563         | 224-237          | 17      | 17        |
| 16   | 350     | 328        | 4564-4577         | 238-251          | 18      | 17        |
| 17   | 351     | 329        | 4578-4591         | 1-14             | 1       | 18        |
| 18   | 352     | 330        | 4592-4605         | 15-28            | 2       | 18        |
| 19   | 353     | 331        | 4606-4619         | 29-42            | 3       | 18        |
| 20   | 354     | 332        | 4620-4633         | 43-56            | 4       | 18        |
| 21   | 355     | 333        | 4634-4647         | 57-70            | 5       | 18        |
| 22   | 356     | 334        | 4648-4661         | 71-84            | 6       | 18        |
| 23   | 357     | 335        | 4662-4675         | 85-98            | 7       | 18        |
| 24   | 358     | 336        | 4676-4689         | 99-112           | 8       | 18        |
| 25   | 359     | 337        | 4690-4703         | 113-126          | 9       | 18        |
| 26   | 360     | 338        | 4704-4716         | 127-139          | 10      | 18        |
| 27   | 361     | 339        | 4717-4730         | 140-153          | 11      | 18        |
| 28   | 362     | 340        | 4731-4744         | 154-167          | 12      | 18        |
| 29   | 363     | 341        | 4745-4758         | 168-181          | 13      | 18        |
| 30   | 364     | 342        | 4759-4772         | 182-195          | 14      | 18        |
| 31   | 365     | 343        | 4773-4786         | 196-209          | 15      | 18        |