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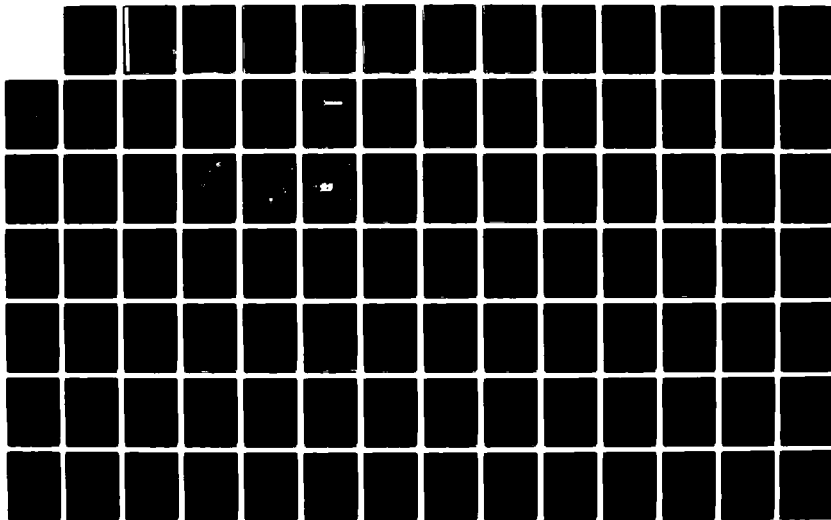
HANDBOOK FOR UCSD SC9 SCATHA AURORAL PARTICLES
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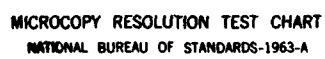
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HANDBOOK FOR UCSD

SC9 SCATHA

AURORAL PARTICLES EXPERIMENT

UNIVERSITY OF CALIFORNIA
SAN DIEGO

La Jolla, California

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HANDBOOK FOR UCSD
SC9 SCATHA
AURORAL PARTICLES EXPERIMENT

University of California at San Diego
La Jolla, California

Center for Astrophysics and Space Sciences
Space Physics Laboratory

Under

UCSD/AF SCATHA F04701-77-C-0062
September 1978 (1st Edition)
August 1980 (Revised Edition)

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HANDBOOK FOR UCSD SC9 SCATHA
AURORAL PARTICLES EXPERIMENT

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TABLE OF CONTENTS

1.0	<u>INTRODUCTION</u>	1
1.1	OBJECTIVES	1
1.2	ACKNOWLEDGEMENTS	1
1.3	SCOPE	1
2.0	<u>SUMMARY</u>	2
2.1	SCIENTIFIC OBJECTIVES	2
2.2	GENERAL INFORMATION	5
2.3	EXPERIMENT DESCRIPTION	20
2.3.1	<u>General Configuration</u>	20
2.3.2	<u>Charged Particle Detectors</u>	20
2.4	DETECTOR COMMANDS AND MODES	31
2.5	COMMAND MODES	44
2.5.1	<u>Detector Rotation</u>	48
2.5.2	<u>Detector Energy Levels</u>	60
2.6	ACCUMULATOR GATING	69
2.7	GEOMETRIC CONVERSION FACTOR	77
3.0	<u>DATA FORMATS AND PROCESSING</u>	79
3.1	SCATHA COMMON BLOCKS	79
3.2	SC9 TAPE LISTING	89
3.3	SPECTROGRAM DESCRIPTION	92
 Appendices		
1.	AFG1 Electron and Ion Gun Experiment (SC4)..	A-1
2.	SC10 Electric Field Monitor	A-4
3.	SC11 Magnetic Field Monitor.....	A-8
4.	Eclipse Times.....	A-13
5.	Measurement List.....	A-19
6.	Data Tape Format.....	A-33
7.	Command List.....	A-79
8.	Status Word Map.....	A-104
9.	Calibration of Experiment SC9.....	A-106

LIST OF FIGURES

2.2-1	SCATHA Space Vehicle	5a
2.2-2	Typical Ground Track During Final Orbit.....	9
2.2-3	P78-2 Orbit and the Magnetosphere	10
2.2-4	SCATHA Orbit and Earth Viewed from Sun	12
2.2-5	Mission Operations Through Spring Eclipse Season...	13
2.3-1	UCSD/SCATHA SC9 Auroral Particles Experiment.....	21
2.3-2	Detector Geometry.....	22
2.3-3	Nominal Field of View.....	23
2.3-4	Location of SC9 on SCATHA Spacecraft.....	24
2.3-5	Sprialtron Bias Scheme, UCSD/SCATHA SC9.....	28
2.4-1	Bit Utilization for 22 Bit Serial Command.....	33
2.5-1	Angle Definition.....	58
2.5-2	Typical Scan Dwell Program.....	61
2.6-1	Accumulator Gating Logic Equations.....	72
3.3-1	SCATHA Spectrogram Gray Scale Contrast Variations..	95
3.3-2	SCATHA Spectrogram Gray Scale Bias Variations.....	96
A-5-1	Theoretical Response UCSD/SCATHA SC9 Detector and Motor Box Temperature Monitors.....	A-28
A-5-2	Theoretical Response UCSD/SCATHA SC9 PCU Temperature Monitor.....	A-29

LIST OF TABLES

2.2-1	Summary of Spacecraft Operations.....	15
2.3-1	ATS-F & SCATHA Discrimination Level Summary, High Energy Detectors.....	26
2.3-2	Spiraltron Bias Voltages.....	29
2.4-1	Command Summary.....	34
2.4-2	SC9 Relay Command Summary.....	36
2.4-3	Serial Command Functions.....	39
2.5-1	North South Rotation Control.....	49
2.5-2	SC9 North South Sweep Angle vs Position Counter.	50
2.5-3	East West Rotation Control.....	54
2.5-4	SC9 East West Sweep Angle vs Position Counter...	55
2.5-5	High Energy Detector Energy Analyzed vs Dwell Step Number and Accumulation Interval.....	66
2.5-6	Typical Values for E0-E63, High Energy Detector.	67
2.5-7	Typical Values E0-E63, Low Energy Detector.....	78
2.6-1	Accumulator Gating.....	70
2.6-2	Accumulator Information.....	71

1.0 INTRODUCTION

1.1 OBJECTIVES

The primary objective of this handbook is to provide a convenient source of information for the UCSD SC9 Auroral Particles Experiment. The expected end users of this document are scientists, programmers, and operators.

1.2 ACKNOWLEDGEMENTS

The UCSD/SC9 Auroral Particles Experiment was developed with funds provided by the National Aeronautics and Space Administration under Goddard Space Flight Center Contract Number NAS 5-21055 , Office of Naval Research Contract Number N00014-76-C-0432 and Air Force Contract Number F4701-77-C-0062.

1.3 SCOPE

The scope of this handbook is all of the scientific information related to the operation of the UCSD/SCATHA SC9 Auroral Particles Experiment

2.0 SUMMARY

2.1 SCIENTIFIC OBJECTIVES

→ The ~~general~~ objective of the ~~experiment~~ is the determination of magnetospheric processes in containing and accelerating charged particles near the earth. Of particular interest are those particles which are deposited into the upper atmosphere to produce aurorae. Geosynchronous orbits are well suited for these measurements as they are, much of the time, situated equatorially on magnetic field lines which connect with the earth in the auroral latitudes. Hence comparison with simultaneous ground base observations will be important.

Two pairs of ion and electron detectors are scanned orthogonally to make determinations of pitch angle distributions and to investigate plasma instabilities and wave-particle interactions. The magnetosphere constitutes a plasma of low density unobtainable in the laboratory.

Measurements made by experiments on ATS satellites in the past indicate also that near the midnight sector considerable changes in particle fluxes occur which coincide with geomagnetic substorm observations on the ground. Substorm Morphology is a subject of continuing interest and it is felt that the SC9 experiment can contribute a great deal to an understanding of it.

→ The modes of penetration of solar wind particles into the magnetosphere and their flow properties will also be studied. Times of enhanced solar activity will be of great interest.

SPACECRAFT CHARGING

The work done in analyzing data from the UCSD detector on ATS-5 (launched into geosynchronous orbit in August 1969) showed conclusively that a spacecraft at synchronous orbit can develop electrostatic charges of thousands of volts both between the spacecraft and the ambient plasma, and between parts of the spacecraft itself. Since then several types of synchronous orbitors have experienced anomalous effects in operation which have been traced to charging. These effects include spurious commands, degradation of amplifiers and solar cells, and in at least one case, complete loss of an Air Force Satellite. Some of the programs so affected are ATS, 777, INTELSAT, and COMSAT.

Unfortunately most of the affected spacecraft carry no plasma diagnostic equipment. Therefore analyses of

suspected charging effects were conducted by comparing times of occurrence with ground-based geomagnetic observations and other satellite measurements (notably ATS-5). It is not surprising that no general one-to-one correspondences have been found between spacecraft anomalies and geomagnetic activity even though the environment-spacecraft interaction is strongly indicated.

The launch of ATS-6 in the Summer of 1974 helped this situation by extending the range of analyzed energies downward from 50 ev (ATS-5) to less than 1 ev. This permits direct observation of the low-energy secondaries and photo-electrons which have been theoretically shown to be important in charge balance. The addition of mechanically rotating detectors on ATS-6 has also permitted viewing fluxes narrowly collimated along the magnetic field line (this was impossible on ATS-5). Surprisingly, fluxes more than 100 times the flux perpendicular to the field have been seen regularly. Note that ATS-6 carries no electric field measuring devices, no magnetic search coils and no mass spectrometer.

As the effects of spacecraft charging have become known, investigation by several agencies realized that no good model existed to predict these effects, and that no spacecraft was planned to be flown at synchronous altitude with instrumentation necessary to provide enough information on which to build adequate models. Thus the Scatha program evolved.

COMMUNICATIONS

In addition to the important study of spacecraft charging, the instrument payload on SCATHA will be admirably suited to studying the naturally occurring and artificially stimulated wave particle interaction in the magnetosphere plasma at synchronous altitude under a wide variety of conditions of the local plasma. An improved understanding of the interaction between the electromagnetic waves and the particle constituents in the plasma is thought to extend our understanding of the origin of the particles and their injection, acceleration, transport, and loss processes and to assess the feasibility of modifying the natural plasma composition or the wave characteristics

- 1) for communication purposes,
- 2) to precipitate or enhance trapping of energetic particles in order to modify the lower ionosphere,
- 3) as a technique of further investigation of

geophysical processes.

In all of these objectives and goals for SCATHA, the UCSD Auroral Particles Detectors play a key role. While the true value of SCATHA is in its coordinated set of instruments, it would be no exaggeration to say that the UCSD SC9 Auroral Particles Experiment is the single most valuable.

2.2 GENERAL INFORMATION

Spacecraft - The P78-2 (SCATHA) spacecraft is a spinning satellite that will be placed in a near synchronous, near equatorial earth orbit from the Eastern Test Range by a Delta 2914 in January 1979. The satellite houses, protects and supports thirteen scientific and engineering experiments. It spins about an axis in the orbit plane and normal to the sunline. The satellite is controlled by the Air Force Satellite Control Facility (AFSCF) and communicates directly with remote tracking stations in New Hampshire, the Indian Ocean, Guam, Hawaii and at Vandenberg AFB. The mission is planned for a one year duration and the Space Vehicle is provided with sufficient consummables for two years. Actual lifetime of the satellite will probably be limited by survival of electronic equipment in the ionizing radiation environment.

Satellite Configuration - the body of the satellite has a cylindrical shape approximately 1.75 meters in both length and diameter. On orbit seven experiment booms are deployed. The final configuration is shown in Figure 2.2-1. In addition to the booms antenna hardware and some instrument protrusions alter the basic cylindrical geometry.

Most of the Spacecraft and Payload equipment is mounted in the central, bellyband portion of the cylinder, instrument apertures, test surfaces, and experiment booms are located in this region. The boom arrangement isolates sensitive instruments from Space Vehicle influences and provides clear fields-of-view for experiments sensitive to low energy particles or contamination. The bellyband is covered with access panels coated to meet requirements of the experiments and the thermal control subsystem. Two solar arrays encircle the cylinder, one forward and one aft of the bellyband. The apogee insertion motor (AIM) is housed in a central tube. A tripod mounted on the central tube supports the forward communications antenna mast and a spider structure that in turn supports equipment located at the forward end.

Materials - Special lightweight materials are used in the spacecraft structure because the P78-2 orbit and payload are near the maximum capability of the Delta 2914 launch vehicle. The center tube is made of magnesium. The aft equipment deck is aluminum honeycomb. The forward deck is an aluminum beam structure. The solar array substrates are aluminum core honeycomb with a fiberglass outer face and an aluminum

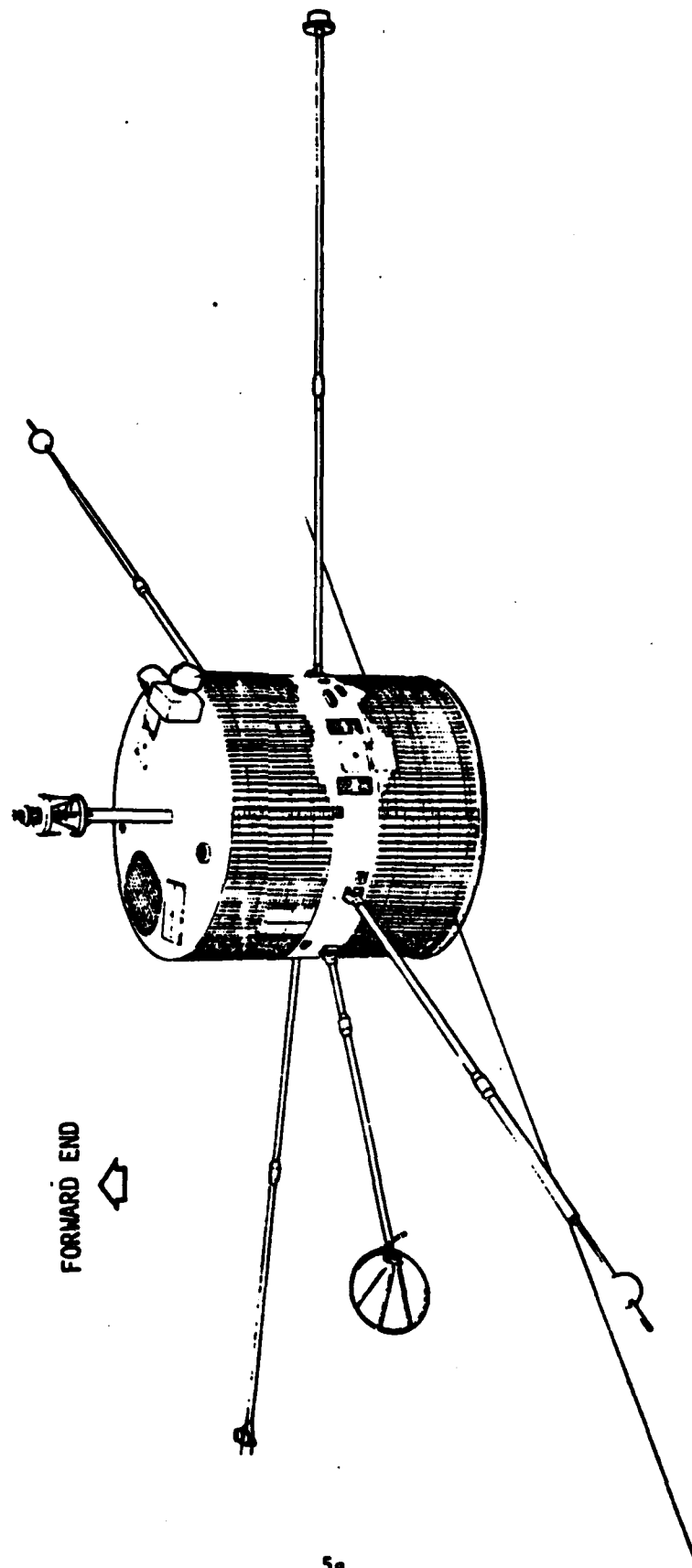


Figure 2.2-1
SCATHA SPACE VEHICLE

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arrays is mostly reradiated to space since the emissivity of the outer surface of the arrays is much higher than that of the inner face. The bellyband access panels, covered with second surface mirrors and thermal control paints, run cool in the sun light and function as effective radiators of waste energy from the deck mounted equipment. Equipment at the ends of the spacecraft is kept warm by radiation from the deck mounted equipment. To make this approach effective rejection of heat by the end surfaces has been minimized. The thermal design contains special features to accommodate the following aspects of the mission and payloads.

1. The solar arrays are isolated from the equipment sections to prevent excessive radiative cooling during eclipse periods.
2. Some payloads and electric heaters are turned on in the transfer orbit to limit cooling of the spacecraft during this period.
3. A few components with low operating temperatures are isolated from spacecraft heat sources and radiatively coupled to the external environment.
4. Critical components such as batteries, the AIM and hydrazine rocket subsystem tanks, lines and valves are electrically heated.
5. The AIM is a large heat source during its burn and subsequently until it is jettisoned. The insulation which protects the satellite from this heat source also prevents significant heat rejection through the aft central cavity during the mission operations period.
6. The Rapid Scan Particle Detector (SC5) view cavity is pointed normally to the sunline. The walls of the cavity are radiatively isolated from the equipment compartments to prevent excessive heat loss through this cavity.

Electrical Power - 291 watts of power for spacecraft and payload functions are obtained from two solar arrays. The arrays are basically cylindrical with some irregularities in configuration to provide special surfaces surrounding instrument apertures and test samples. The projected area of each array is approximately 15 square feet averaged over a complete satellite spin rotation. The spacecraft and experiment electrical loads are supplied by the array except when those loads exceed the array capability. At such times

three Nickel Cadmium batteries supply the additional power. In particular, the batteries supply the entire load during boost phase and eclipse operation. When the array capability exceeds the loads the batteries are charged. Any excess power is dissipated in resistive radiators.

The high sensitivity spectrum analyzers in payload SC1 can be commanded to operate from a separate battery if required to do so to achieve suitable isolation from electromagnetic interference.

Data System - The basic data rate from spacecraft and payloads is 8192 bits per second. This data can be transmitted in real time or tape recorded for later transmission. Data transmission in the tape playback mode takes place at 65536 bits per second. Each of the two tape recorders has a 12 hour capacity. The normal procedure is to record on one tape recorder until it is full. The other recorder, previously filled, is played back during periodic ground contacts.

In addition to the 8192 bps data stream there is a 512 bps channel and a broadband channel. The 512 bps channel contains critical spacecraft and payload information that also appears in the 8192 bps data. The 512 bps and 8192 bps channels are not used simultaneously. The broadband channel provides frequency response up to 5 KHZ and can be used in a number of different modes to handle analog data from one or more experiments.

At any time the use of a particular data mode depends on the capability of a tracking station to close the appropriate telemetry link and the availability of that station to support the mission. The spacecraft has the capability at all times in the final orbit to close some telemetry link with the system of ground stations.

Data Transmission - Real time or recorded data are transmitted to the AFSCF ground stations by an S-Band downlink. Either of two redundant transmitters may be used with any of three antennas in this link. The transmitter output is 10.5 watts. The carrier is modulated with a 1.024 MHZ PSK (phase shift keyed) subcarrier. The 1.024 MHZ subcarrier can be used alone or summed with either a 1.7 MHZ PSK subcarrier or a 1.7 MHZ FM subcarrier.

Omni antennas, mounted at both ends of the spacecraft, provide full spherical coverage. Each of these antennas consists of crossed flat dipoles over a truncated, slotted cone. The dipoles are fed in quadrature. The third antenna is a radial array mounted on the same mast

as the forward omni. This antenna consists of two crossed dipoles over truncated, slotted cones, placed back-to-back. These dipoles are fed in parallel and in phase to radiate a toroidal pattern coaxial with the vehicle spin axis. Annular ring resonant cavity chokes are used to narrow the beam from this antenna. The radial array is used for data transmission only, while the omnis are used for command reception as well.

Command and Timing - The command system is fully redundant. Two omni antennas, one at each end of the spacecraft, feed either of two strings of receiver-demodulator, decoder and command distribution units. The system accepts commands from the AFSCF-SGLS (Space-Ground Link Subsystem). The maximum command rate is one per second. Latching and momentary, high current (relay driver) and low current (logic level), contact closure and serial digital commands are provided to payloads and spacecraft subsystems. Timing

signals ranging in frequency from 2^{-8} Hz to 2^{18} Hz are distributed. These signals are generated from a basic oscillator output that is initially accurate to plus or minus 1 ppm and drifts less than 0.01 ppm/day.

Attitude Control and Determination - Spacecraft attitude is determined from the outputs of four digital sun sensors and two steerable horizon crossing indicators. These data are processed on the ground and control actions are directed by uplink command. Two rocket engine modules provide thrust for precessing the spin axis, controlling the spin rate and imparting velocity increments for orbit adjustment. Each module consists of one 6.67 pound thrust and three 0.238 pound thrust hydrazine rocket engines. Two oil filled nutation dampers provide angle damping. In the final spacecraft configuration, with all booms deployed and the satellite spinning at one RPM, the damping time constant is 8 hours.

The Orbit - The satellite is placed in a 100 by 23100 nautical mile transfer orbit by the Delta 2914 launch vehicle. This orbit is inclined 28.77 degrees to the equatorial plane. At apogee on the fourth revolution the satellite performs a combined maneuver raising perigee altitude to 15038 nautical miles and reducing the inclination to 8.3 degrees. The final orbit is adjusted to provide a slow easterly drift of the satellite ground track, typically 6 degrees per day, (Figure 2.2-2).

The spatial relationships between the Earth, its magnetosphere and the satellite orbit are shown qualitatively in Figure 2.2-3. On March 20, the fifty-fifth day of the mission, the satellite orbit

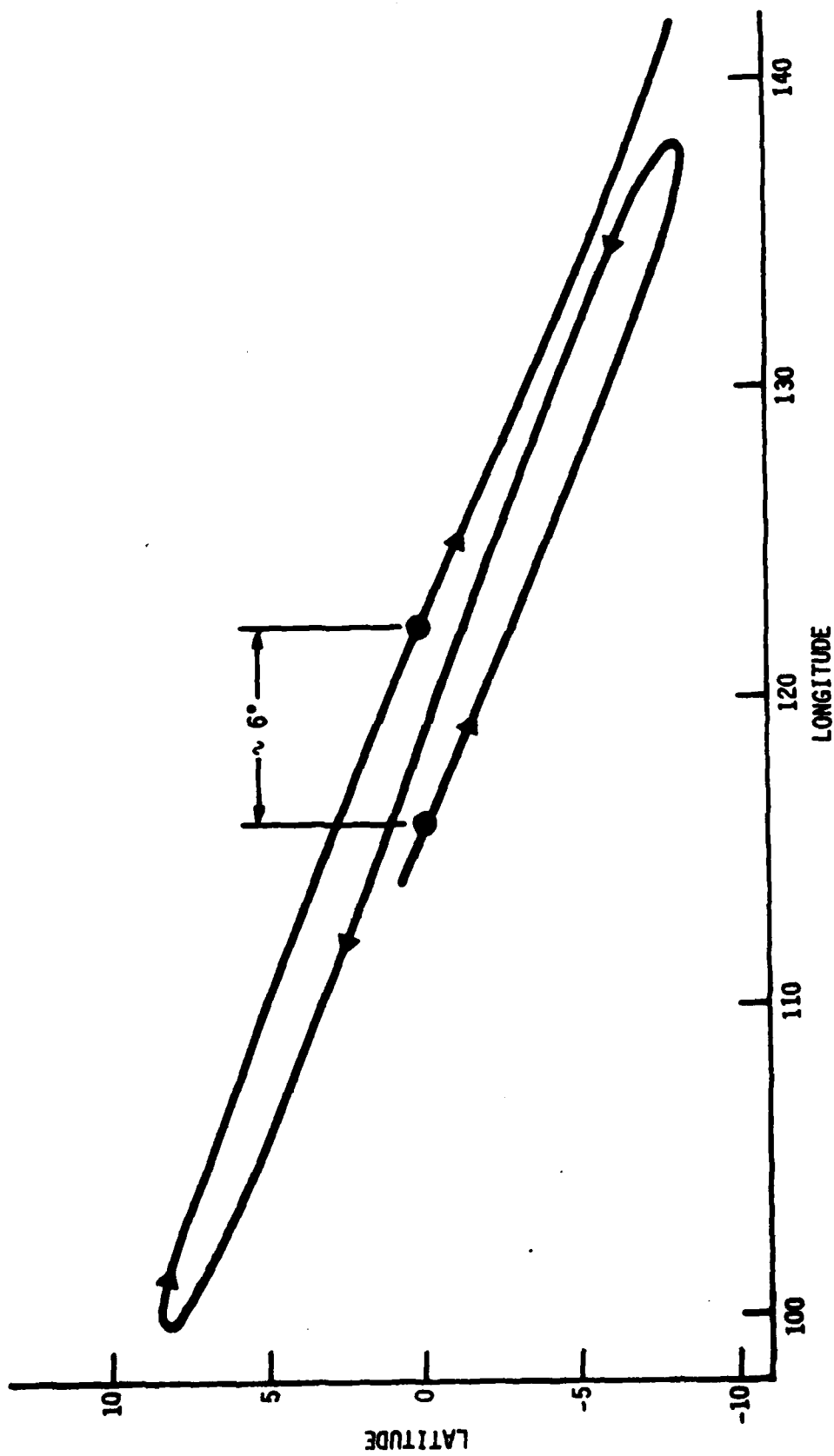


Figure 2.2-2
TYPICAL GROUND TRACK DURING FINAL ORBIT

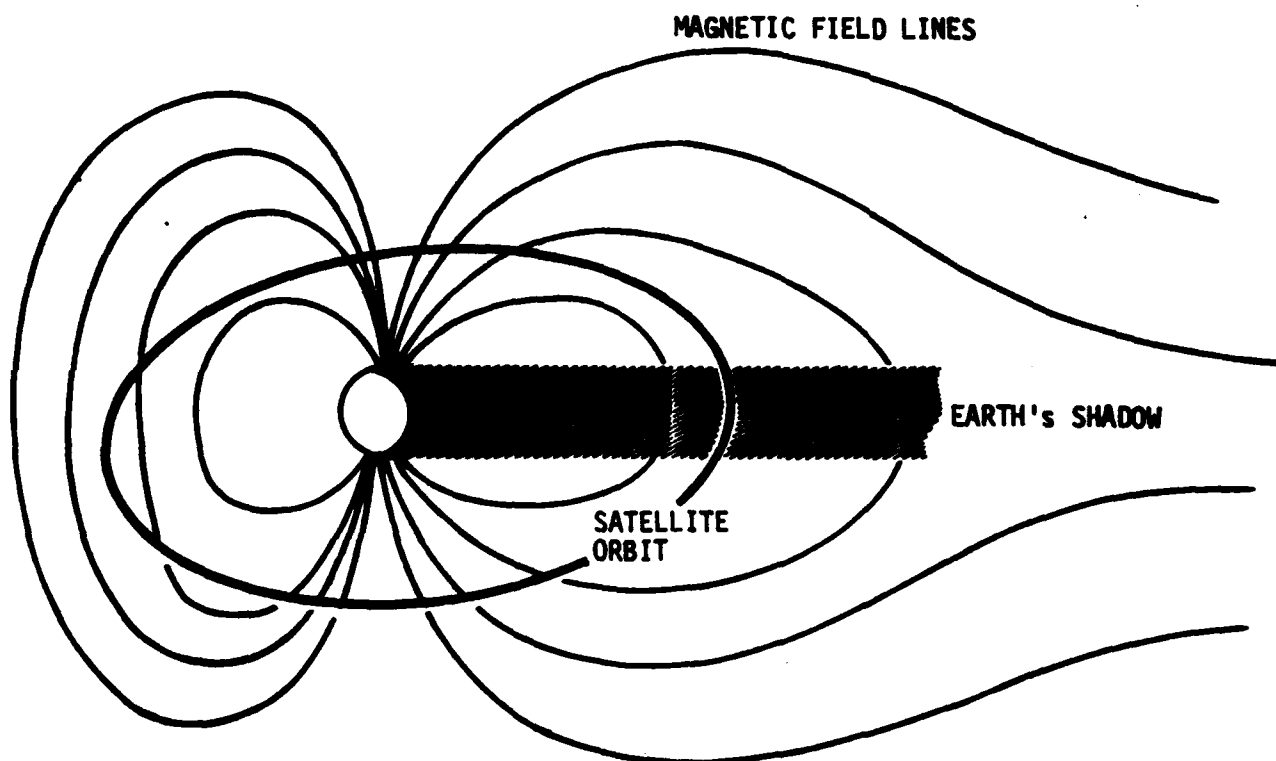


Figure 2.2-3
P78-2 ORBIT AND THE MAGNETOSPHERE

begins to intersect the Earth's shadow (Figure 2.2-4'). This spring eclipse season lasts forty-four days with a maximum eclipse duration of seventy-one minutes. A second eclipse season is encountered in the fall.

NOTE: See Appendices for list of eclipse times.

Operations - Science activity on P78-2 is usually limited by ground data handling capacity. In principle the satellite could support 24 hours each day of narrow band activity and up to ten-hours of broadband activity. The total tape recorder capacity is 24 hours of data so to support full time activity the tape recorders would need to be completely played back once a day. The AFSCF controls many other satellites so it may not always be able to provide P78-2 with the contact time desired to playback the recorders and support the broadband activity too. When contact time is available experiment operation is limited by spacecraft data handling capabilities. An exception to this occurs on the days of the longest eclipses. At those times broadband data transmission and operation of the electron and ion guns is restricted to avoid exceeding an 80% discharge of the batteries.

The mission sequence (see Figure 2.2-5), following orbit insertion and ejection of the insertion motor, calls for adjustment of the orbit to achieve a slow eastward drift of the ground track. The satellite spin axis is then oriented normal to the sunline. This orientation is essential to satisfactory operation of the scientific payload as well as operation of the spacecraft power subsystem. The spin axis is precessed throughout the mission at approximately one week intervals to maintain normality to the sunline. Once the satellite is properly oriented booms are deployed for the thermal electron (SC6), the spacecraft sheath fields (SC2), the magnetic field (SC11) and the RF fields (SC1) experiments. The payloads are checked out individually and in combination during the next few days and then begin normal operation. Exceptions are the electron and ion guns (SC4) and the electric fields (SC10) experiment.

The inherent danger of electron and ion gun operation for the electron multiplier type of detectors used in many of the payloads requires special operational precautions. For this reason initial gun operations do not start for at least three weeks. The first eclipse season may begin before the guns are fully checked out. Whether or not checkout is complete, gun operation will be suspended for ten days beginning shortly before the first eclipse. Checkout of the guns will be completed, if it has not previously been finished, during the remainder of the eclipse season. The two 50 meter antennnas deployed for the electric field experiment

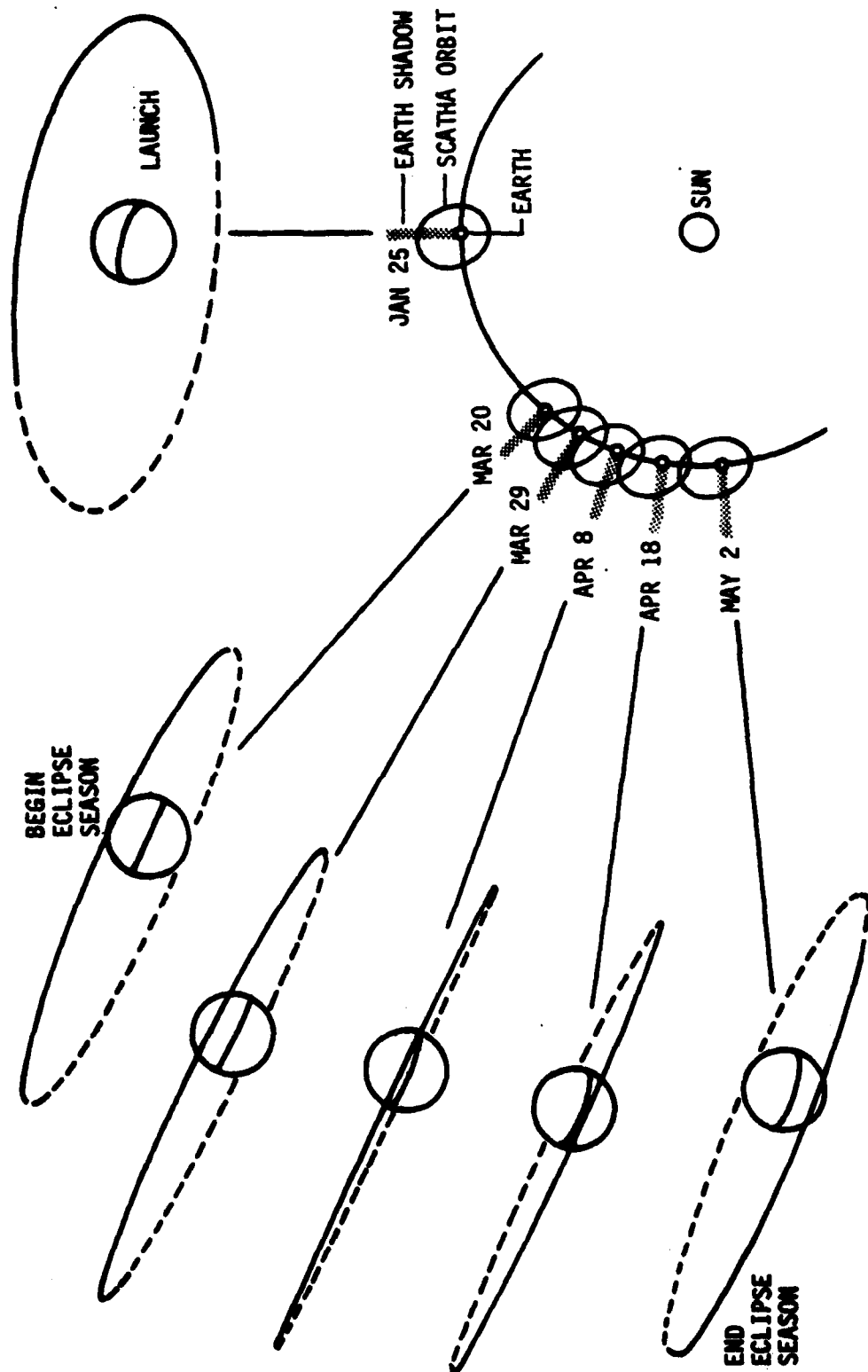
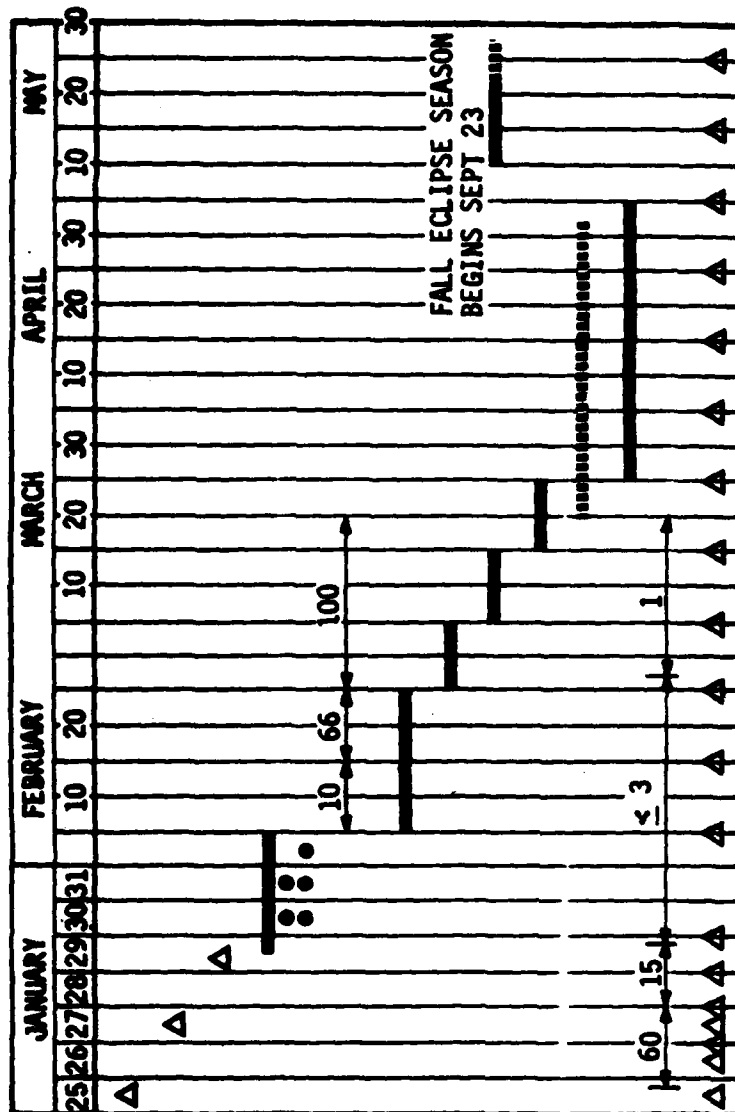


Figure 2.2-4
SCATHA ORBIT AND EARTH VIEWED FROM SUN



LAUNCH
 AIM BURN
 TRIM BURN
 EXPERIMENT CHECKOUT
 BOOM DEPLOYMENT
 LONG DIPOLE EXTENSION (METERS)
 OPERATIONS WITHOUT GUNS
 GUN CHECKOUT
 NORMAL OPERATIONS
 ECLIPSE OPERATIONS WITHOUT GUNS
 SPRING ECLIPSE
 ECLIPSE OPERATIONS WITH GUNS
 SPIN RATE (RPM)
 ATTITUDE MANEUVER

APOGEE	TRANSFER ORBIT	FINAL ORBIT
PERIGEE	23100 n mi	23100 n mi
INCLINATION	100 n mi	15038 n mi
PERIOD	27.4°	8.3°
DRIFT RATE	12.86 hr	23.54 hr
	--	6° DAY EASTWARD

KEY PARAMETERS

Figure 2.2-5 MISSION OPERATIONS THROUGH SPRING ECLIPSE SEASON

will significantly change the electrical configuration of the satellite. To permit baseline data to be taken by experiments sensitive to the satellite electrical configuration and to allow complete observation of effects on spacecraft dynamics, the long antennas will be deployed in steps over a period of weeks beginning 11 days into the mission. At the end of the eclipse season, ninety days into the mission, the P78-2 satellite and its varied and interactive payload begin what can be called normal operations.

TABLE 2.2-1

SUMMARY OF SPACECRAFT OPERATIONS

DAY	SC-9 EVENTS	IMPT. SPACECRAFT EVENTS
30	check-out; scan mode	LAUNCH 1:42 pst
31	check-out; scan mode	
32	check-out; limited data	
33	limited data; FM mode	Aim burn (18:00); ATT change
34	limited data	
35	limited data	
36	limited data	Aim Separation
37	limited data	
38	limited data	FINAL ORBIT
39	Bias Test; check-out	SC-2 Boom deploy
40	Data really begins; FM mode	
41	check-out; FM mode	SC-6 failure
42	FM mode	Initial Gun Operation
43	on	
44	on	Gun On
45	on	Gun On
46	on	Gun On
47	on	Gun on; ATT maneuver (?) Induced Charging Event (ICE)
48	on	Transmitter trouble; XMTR1- Degraded; XMTR2 Turned ON
49	on	SC-7 failure
50	on	EMI Test
51	on	Prestorm; SC-7 failure

Table 2.2-1 cont.

52	on	Spin up; Storm MP crossing; Trans. 1 diagnostics
53	on	Magnetosheath encounter; SC-11 On; SC1-4 boom deploy
54	on	Still storm
55	on	SC-6 boom deployment
56	limited data	SC10 boom extension(10 m); T-R dumps off; 20 min passes; ATT man
57	on	20 min passes
58	on	20 min passes; SC10, SC11 data
59	on	20 min passes
60	on	
61	on	XMTR-1 check-out
62-67	limited data	
68	limited data	SC10 full boom extension
69-72	limited data	
73	limited data	Precession maneuver
74	limited data	
75	limited data	Enter ECLIPSE PERIOD (penumbral)
76	on	Enter umbral eclipse period; precession maneuver
81	on, off during ATT maneuver	EDG EVENT ATT Maneuver (22:00, zulu time)
87	on	LUNAR ECLIPSE (8:00-12:00 zulu time); EDG EVENT
88	on	EDG EVENT
89	on	GUN ON; SC-2 malfunction; EDG EVENT
90	on	GUN ON
91	on	GUN ON
92	on	GUN ON; EDG EVENT

Table 2.2-1 cont.

93	on	GUN ON; EDG EVENT
94	on	GUN ON; ICE EVENT; EDG EVENT (entire day)
95	on; BIAS TEST	GUN ON; ICE; EDG EVENT
110	on	ICE
111	on	GUN ON
112	on	GUN ON
113	on	GUN ON
114	on	ICE; EDG EVENT
115	on; BIAS TEST	GUN ON
116	on	GUN ON
119	on	END ECLIPSE PERIOD (umbral)
120	on	END ECLIPSE PERIOD (penumbral)
124	on	SEE check-out
125	on, off during ATT maneuver	Attitude maneuver (02:00)
132	on, off during ATT maneuver	ATT maneuver (01:00)
139	on, off during ATT maneuver	ATT maneuver (05:00)
143-145	on	Geos 2 conjunction period
146	on, off during ATT maneuver	Geos 2 conjunction period; ATT maneuver (04:00)
147-151	on	Geos 2 conjunction period
152	on; cnt not there;	Geos 2 conjunction period; GUN ON
153	on; cnt not there; off during ATT man.	Geos 2 conjunction period; GUN ON ATT maneuver (03:00)
154	on; cnt not there	Geos 2 conjunction period;
155	on; cnt not there	Geos 2 conjunction period;

Table 2.2-1 cont.

163	on, off during ATT maneuver	ATT maneuver (03:00)
173	on, off during ATT maneuver	ATT maneuver (21:00)
179	on; BIAS TEST	
184	on, off during ATT maneuver	ATT maneuver (15:00-18:30)
194	on, off during ATT maneuver	ATT maneuver (17:30-18:30)
200	on	GUN ON; EDG EVENT
201	on; BIAS TEST	GUN ON; EDG EVENT
202	on	GUN ON
208	on, off during most of ATT maneuver	ATT maneuver (22:00-24:00)
218	on, off during ATT maneuver	ATT maneuver (22:00)
228	on, off during ATT maneuver	ATT maneuver (13:00)
238	on, off during ATT maneuver	ATT maneuver (11:00-12:00)
248	on, off during ATT maneuver	ATT maneuver (14:00-18:00)
251	on	SC1-7 EMI Test
263	on	BEGIN ECLIPSE PERIOD (penumbral)
264	on	BEGIN ECLIPSE PERIOD (umbral)
268-273	eclipse ops. once a day	
275	on	GUN ON
278	on; BIAS TEST	
285	on	GUN ON
293	on	GUN ON
295	on	GUN ON

Table 2.2-1 cont.

297	on	GUN ON
298	on	GUN ON
306	on, off during ATT maneuver	END ECLIPSE PERIOD (UMBRAL); ATT maneuver (12:00-14:00)
308	on	END ECLIPSE PERIOD (penumbral)
316	on, off during ATT maneuver	ATT maneuver (12:30-14:00)
326	on, off during ATT maneuver	ATT maneuver (14:00-16:00)
331	on, off during ATT maneuver	ATT maneuver (20:00-22:00)

2.3 EXPERIMENT DESCRIPTION

2.3.1 General Configuration

The UCSD/SCATHA SC9 Auroral Particles Experiment illustrated in Figure 2.3-1 has a compliment of five detectors. Two detectors, one detector of negatively charged particles and one detector of positively charged particles, are contained in each Rotating Detector Assembly (RDA). Each Rotating Detector Assembly is attached to the main housing by a shaft driven through worm gears by a stepper motor. An RDA can be rotated through some 220 degrees, thus enabling one to make measurements of the flux of charged particles at different angles. The two RDA'S rotate in planes which are orthoganal. An additional detector of positively charged particles is mounted in the main housing and is called the Fixed Detector Assembly (FDA).

Figure 2.3-2 illustrates the detector geometry while Figure 2.3-3 illustrates the nominal field of view of each detector. The UCSD/SCATHA SC9 Auroral Particles Experiment is mounted to the SCATHA Spacecraft as shown in Figure 2.3-4. Details of spacecraft orientation and mounting geometry can be found in Section 2.2.

2.3.2 Charged Particle Detectors

Each Detector is made from three subassemblies:

- 1) an electrostatic curved plate energy/unit charge analyzer
- 2) an electrostatic grid structure which acts as a lens to focus those particles that have passed through the energy analyzer upon the sensor
- 3) a Bendix model 4213-PAC/WL spiraltron particle sensor with appropriate pulse electronics which counts the analyzed particles.

The Electrostatic Analyzer

The plates of the energy analyzer are driven by a power supply that can be programmed to supply any one of 64 voltage steps. In the SCATHA configuration, one of the RDA'S is a high energy detector while other RDA and the Fixed Detector Assembly are low energy detectors. For the high energy detector, the energy range covered by the 64 voltage steps is approximately 1 to 80,000 e.v. and for the low energy detector's the energy range is approximately 1 to 2,000 e.v.

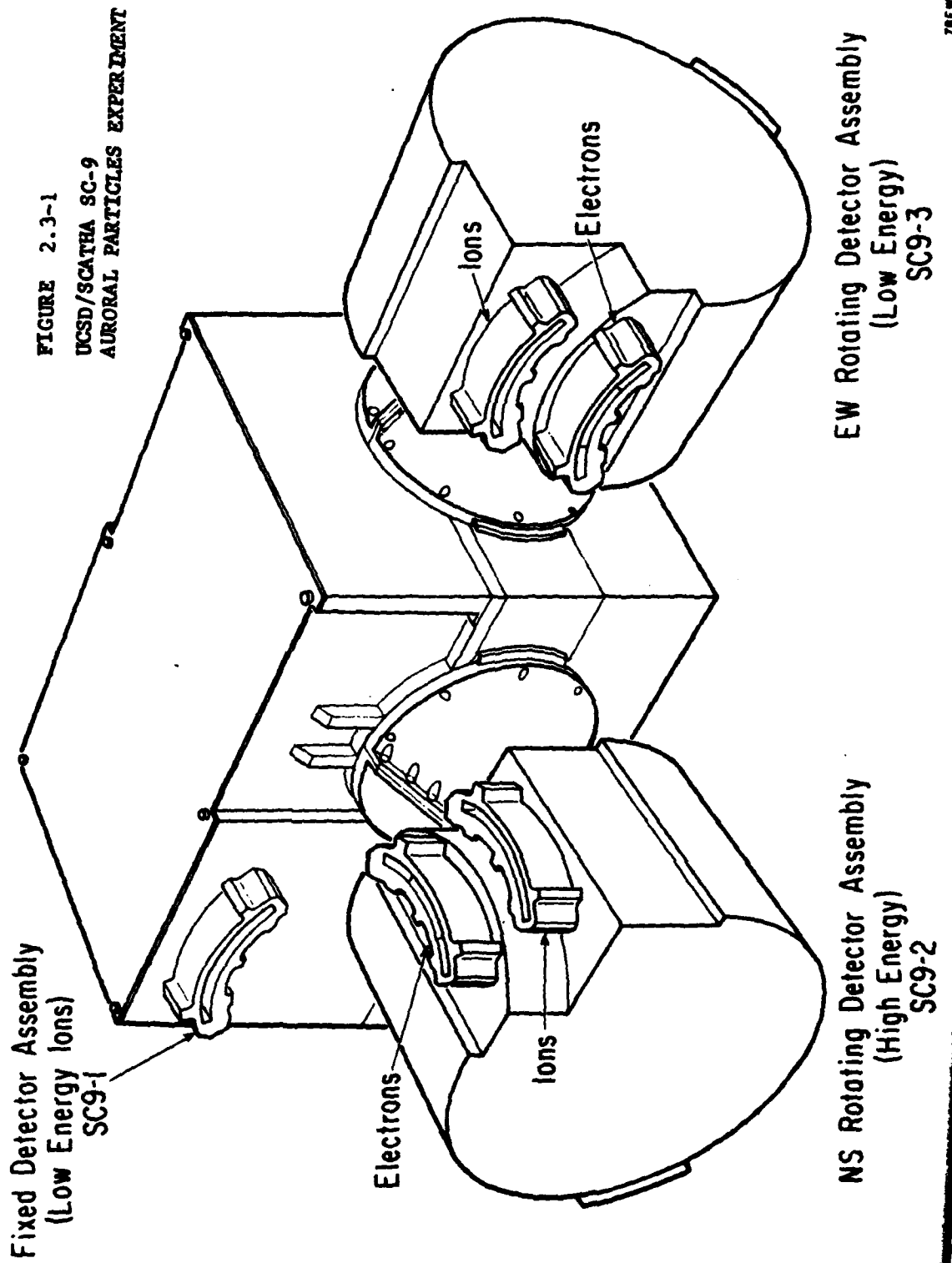
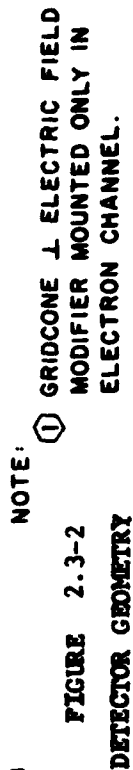


FIGURE 2.3-1
UCSD/SCATHA SC-9
AURORAL PARTICLES EXPERIMENT



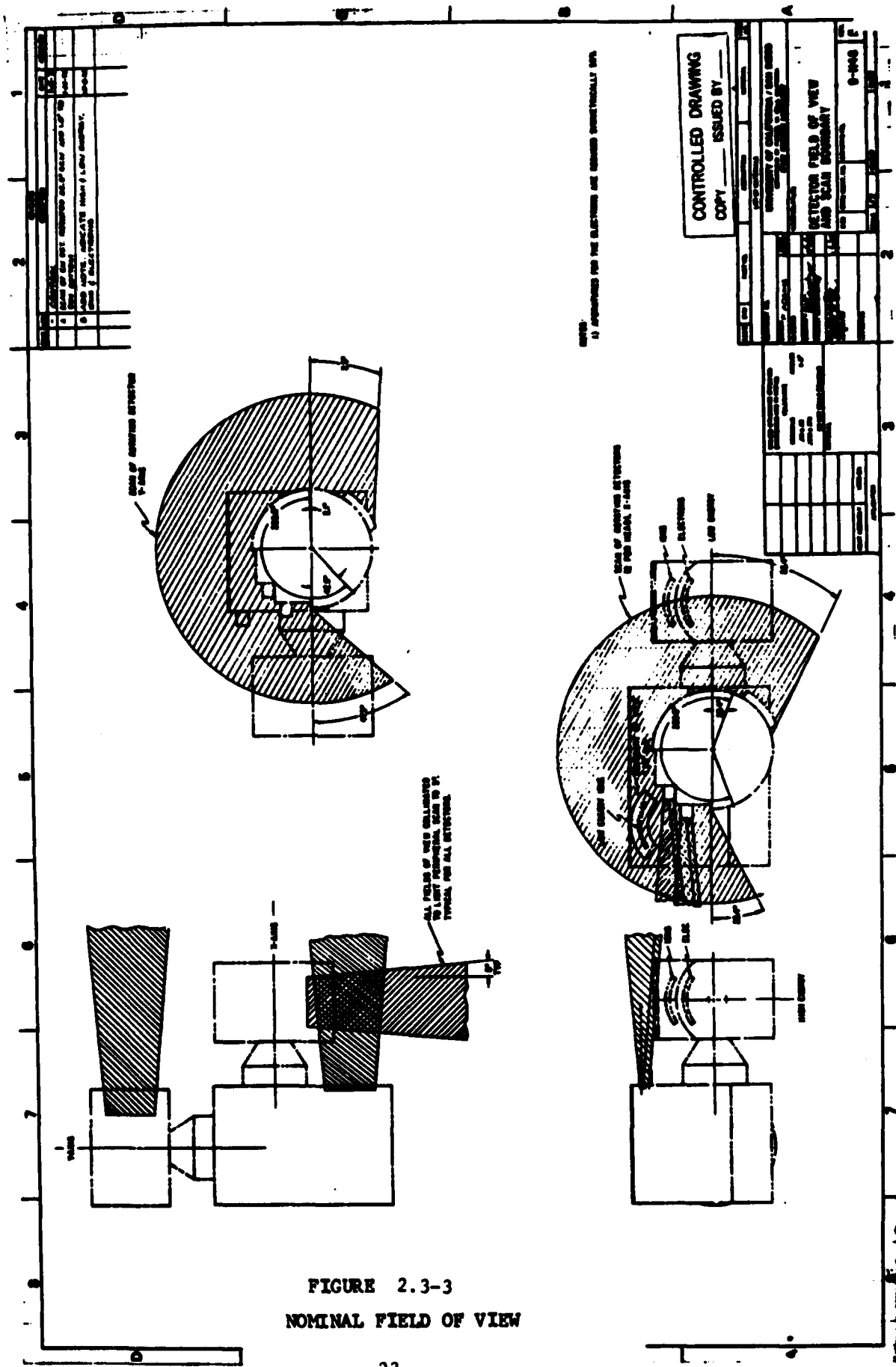


FIGURE 2.3-3
NOMINAL FIELD OF VIEW

NOTE: 1) APPROVED FOR THE ELECTRONIC AND ELECTRONICALLY SENSITIVE

CONTROLLED DRAWING
COPY ISSUED BY

NO.	REV.	DATE	BY	CHKD.	APP.	DESCRIPTION
1						DETECTOR FIELD OF VIEW AND SCAN BEAM
2						
3						
4						
5						
6						
7						
8						
9						
10						

NO.	REV.	DATE	BY	CHKD.	APP.	DESCRIPTION
1						DETECTOR FIELD OF VIEW AND SCAN BEAM
2						
3						
4						
5						
6						
7						
8						
9						
10						

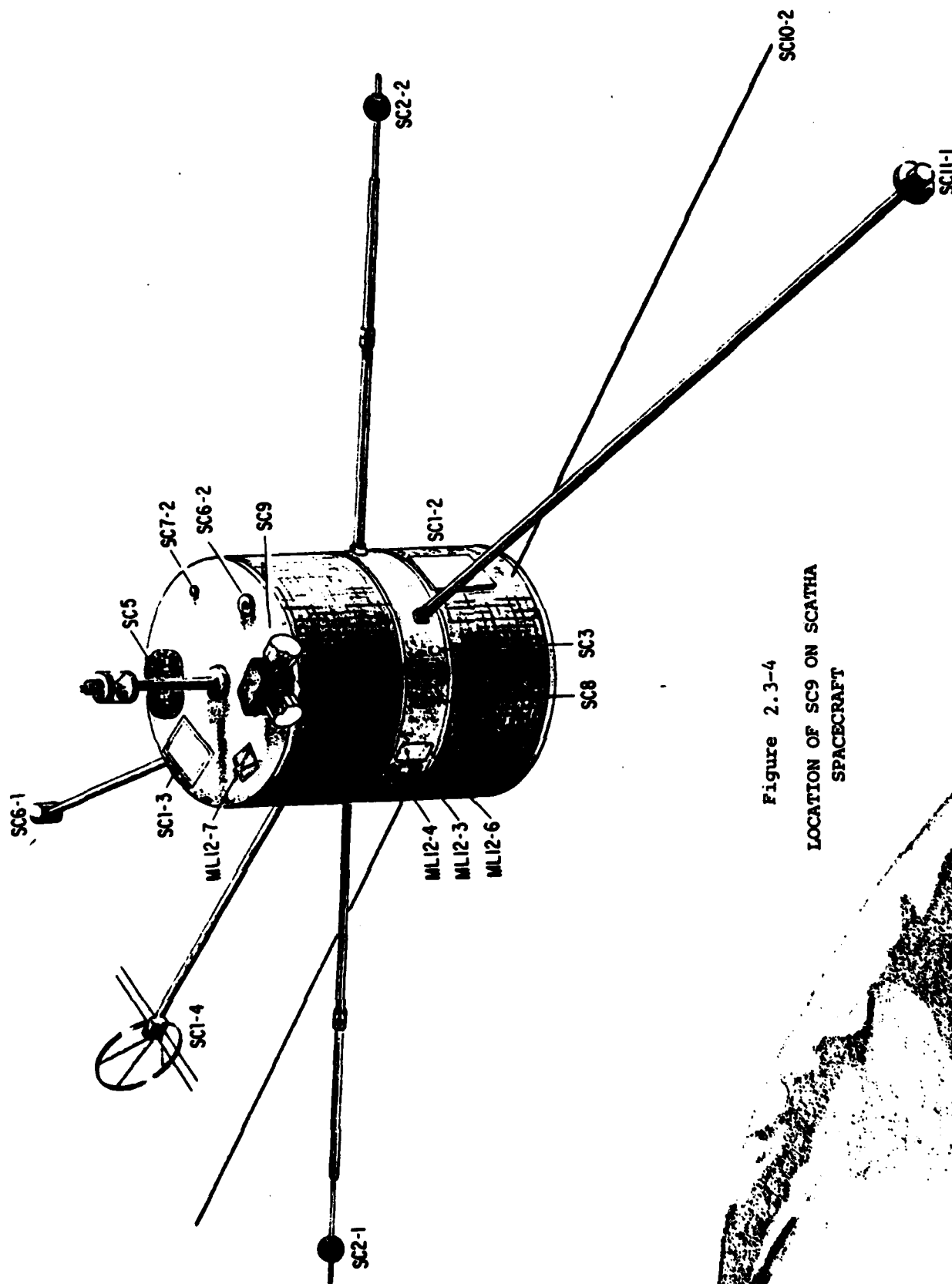


Figure 2.3-4
LOCATION OF SC9 ON SCATHA
SPACECRAFT

For a more detailed discussion of energies see Section 2.5.2. The energy resolution $\Delta E/E$ of the analyzer is approximately 20 per cent. The analyzer constant is approximately 11 for each type of detector.

The Electrostatic Lens

A structure made of two wire grids is positioned immediately after the energy analyzer. The first grid is held at the potential of the inner plate. The second grid is held at the potential of ground. A particle passing through this structure is strongly focused upon the center of the sensor.

The Particle Sensor

A Bendix Model 4213-PAC/WL spiraltron particle sensor detects each charged particle which has passed through the energy analyzer. Pulse electronics attached to this sensor amplifies its output and sets a nominal dead time of 3.3 microseconds. (See Table 2.3-1 for amplifier gain and discriminator levels). This rate limiting provides a stable well known dead time so that true counting rates of 10^7 counts/second can be measured unambiguously. The high voltage biasing of the spiraltron is illustrated in Figure 2.3-5 and Table 2.3-2 contains the bias voltage for each sensor vs latching command state. The first 1.445 inches of each sensor is shielded with a surrounding gold cylinder 0.040 inches thick. This shield reduces the background rate from penetrating radiation.

Suppression of secondary electrons and some additional focusing is accomplished by a semi-spherical shield (See Figure 2.3-2) which lies between the sensor and the electrostatic lens. The proton suppressor is at zero potential for each detector assembly. The electron suppressor for the low and high energy detectors are independently controlled by magnitude command and can be at -30 volts continuously or vary with step number as follows;

Low energy detector

Steps 0 thru 31 suppressor voltage is 0.0 volts

Steps 32 thru 63 suppressor voltage is -18.17 volts

High energy detector

Steps 0 thru 15 suppressor voltage is 0.0 volts

Steps 16 thru 63 suppressor voltage is -30.0 volts

TABLE 2.3-1
ATS-P & SCATHA DISCRIMINATION
LEVEL SUMMARY
HIGH ENERGY DETECTORS

UNIT	DETECTOR	AMP $\mu\text{V}/\text{e}^-$ GAIN	DISC LEVEL MV	DISC LEVEL $\# \text{e}^-$	TEST JACK ATTEN.	CROSS COUPLING MV	FLYBACK MV	NOISE MV	THRESHOLD 1 mHz to case via 68 Ω
SN03	EDA Ser #05, Electron Proton	0.611 0.233	90mv 111mv	1.35×10^5 4.78×10^5	10.19 9.411	40mv	< 35mv	-35mv	14v P-P ----
	EDA Ser #06 Electron Proton	0.789 0.160	90mv 60mv	1.14×10^5 3.75×10^5	14.17 6.9	< 30 30	60 30	< 30 < 20	18v P-P ----
	FDA Ser # Proton	0.171	90mv	5.25×10^5	5.95	20	25	< 20	----
	EDA Ser #03 Electron Proton	0.6285 0.199	110mv 70mv	1.75×10^5 3.5×10^5	17.14 15.0	< 80mv 30mv	< 90 70	30 20	5.6 * ----
SN02	EDA Ser #04 Electron Proton	0.562	120mv 100mv	2.135×10^5 3.51×10^5	14.1176 13.57	< 90 < 45	100 90	4 20	1.3 VPP* ----
	FDA Ser # Proton	0.279	65mv	2.32×10^5	----	----	----	----	----

NOTE: ATS-VI consists of the following:

MSRDA SN05 FDA SN03
KMRDA SN03

* 68 Ω to outer screw balance bar

(Continued)

TABLE 2.3-1
ATS-F & SCATHA DISCRIMINATION
LEVEL SUMMARY
HIGH ENERGY DETECTORS

UNIT	DETECTOR	AMP GAIN $\mu\text{V}/\text{e}^-$	DISC LEVEL mV	DISC LEVEL $\phi \text{ e}^-$	TEST JACK ATTEN.	CROSS COUPLING mV	FLYBACK mV	NOISE mV	THRESHOLD 1 mHz to base via 680
	HDA SN 01 MLBC ION	0.730V/ e^-	240mV	3.5×10^5	TBD	TBD	TBD	2.2×10^5	TBD
		.3870V/ e^-	120mV	3.1×10^5	TBD	TBD	TBD	1.4×10^5	TBD

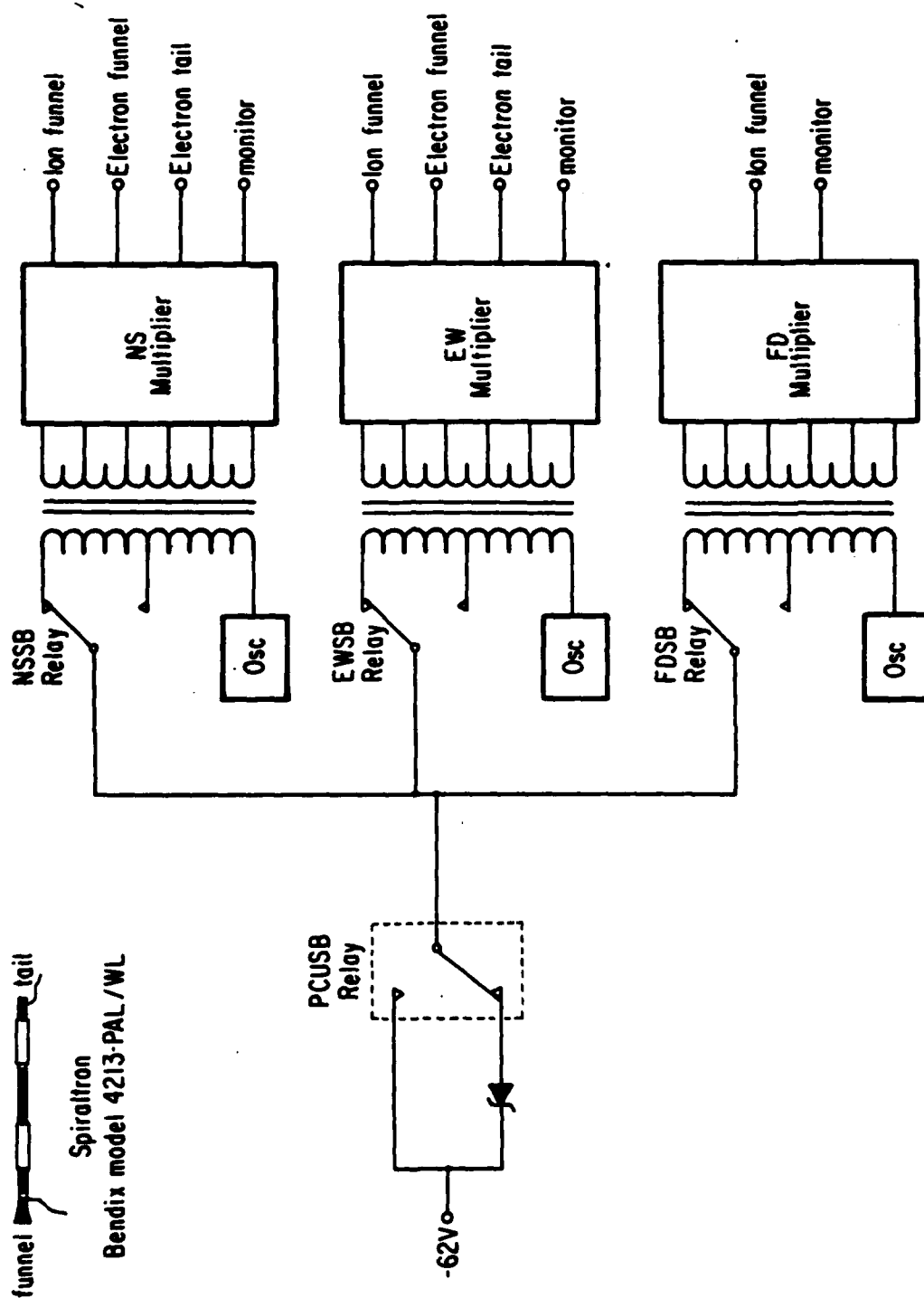


Figure 2.3-5 SPIRALTRON BIAS SCHEME, UCSD/SCATHA SC9

7023-9-007

TABLE 2.3-2

SPIRALTRON BIAS VOLTAGESNS SPIRALTRON BIAS (HIGH ENERGY)

LATCH CMD #		SPIRALTRON		VOLTAGES		PERFORMANCE PARAMETERS
7021	7020	ELECTRON		ION		
		FUNNEL	TAIL	FUNNEL	TAIL	J4007
0	0	+230	+2660	-2460	~0	1.58
0	1	+272	+3130	-2890	~0	1.80
1	0	SEE NOTE AT PAGE BOTTOM				1.30
1	1	SEE NOTE AT PAGE BOTTOM				1.50

EW SPIRALTRON BIAS (LOW ENERGY)

LATCH CMD #		SPIRALTRON		VOLTAGES		PERFORMANCE
7022	7020	ELECTRON		ION		PARAMETERS
		FUNNEL	TAIL	FUNNEL	TAIL	J4008
0	0	+210	+2850	-2600	≈0	1.54
0	1	+240	+3180	-2910	≈0	1.76
1	0	+170	+2390	-2190	≈0	1.22
1	1	+200	+2670	-2440	≈0	1.42

FD SPIRALTRON BIAS

LATCH CMD # 7023 7020	SPIRALTRON VOLTAGES			PERFORMANCE
	ION		PARAMETERS	
	FUNNEL	TAIL	J4009	
0 0	2380	=0	1.38	
0 1	-2660	=0	1.58	
1 0	-2890	=0	1.70	
1 1	-3220	=0	1.96	

NOTE: The remaining values were not determined before the spacecraft was launched.

The commands that control the electron suppressor voltage for the low energy rotating detector assembly are:

MAGNITUDE COMMAND #	FUNCTION DWELL STEP SIZE	ELECTRON SUPPRESSOR VOLTAGE
8287	0	0 volts step 0-31, -18.17 volts step 32-63
8101	1	0 volts step 0-31, -18.17 volts step 32-63
8102	2	0 volts step 0-31, -18.17 volts step 32-63
8103	4	0 volts step 0-31, -18.17 volts step 32-63
8104	8	0 volts step 0-31, -18.17 volts step 32-63
8105	16	0 volts step 0-31, -18.17 volts step 32-63
8106	32	0 volts step 0-31, -18.17 volts step 32-63
8291	0	Fixed at -18.17 volts
8292	1	Fixed at -18.17 volts
8293	2	Fixed at -18.17 volts
8294	4	Fixed at -18.17 volts
8295	8	Fixed at -18.17 volts
8296	16	Fixed at -18.17 volts
8297	32	Fixed at -18.17 volts

The commands that control the electron suppressor voltage for the high energy rotating detector assembly are:

MAGNITUDE COMMAND #	3K GATE	ELECTRON SUPPRESSOR VOLTAGE	ACC GATING MODE
8107-8114	PNS	Fixed at -30 volts	0-7
8115-8122	PNS	0 volts step 0-15, -30 volts step 16-63	0-7
8123-8130	ENS	Fixed at -30 volts	0-7
8131-8138	ENS	0 volts step 0-15, -30 volts step 16-63	0-7
8139-8146	PEW	Fixed at -30 volts	0-7
8147-8154	PEW	0 volts step 0-15, -30 volts step 16-63	0-7
8155-8162	EEW	Fixed at -30 volts	0-7
8163-8170	EEW	0 volts step 0-15, -30 volts step 16-63	0-7
8171-8178	PFIX	Fixed at -30 volts	0-7
8179-8186	PFIX	0 volts step 0-15, -30 volts step 16-63	0-7

2.4 DETECTOR COMMANDS AND MODES

The UCSD/SCATHA SCC experiment is controlled by 21 discrete commands and one 22 bit serial magnitude command.

Latching Command Description - 21 discrete commands are used to set and reset 15 latching relays which in turn provide either 28 volt power or 10 volt logic levels to SCC. Table 2.4-2 provides the function each of the 21 discrete commands perform along with the appropriate number and names. Note that 7002 and all commands that end with the number 5 are used as resets while all others are used as sets.

Magnitude Command Description

SC9 receives from the spacecraft a 22 bit serially command referred to as a magnitude command. Bit utilization for the 22 bit serial command is as shown in Figure 2.4-1.

Note that bits 11 - 14 are used as an address field creating 16 possible addresses for the information in bits 15 - 22 which are referred to as data bits. Bit 15 corresponds to the MSB and bit 22 corresponds to the LSB.

Table 2.4-1 is a summary of the 16 addresses in binary, octal and decimal vs. the strobe, the FORTH test name, and description of data transfer.

Table 2.4-3 summarizes by functional grouping the types of commands with typical response values.

For example, the command 10 NSLL would cause the number 10 to be stored in the NSLL register when the strobe STNSLL occurs. The 22 bit field would be as follows:

Bit # MAGNITUDE COMMAND																					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
X	X	X	X	X	X	X	0	X	X	0	0	0	0	0	0	0	0	1	0	1	0
X = DON'T CARE										ADDRESS				DATA							

63 DT =

X	X	X	X	X	X	X	0	X	X	0	1	1	0	0	0	1	1	1	1	1	1
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

255 EWUL =

X	X	X	X	X	X	X	0	X	X	0	0	1	1	1	1	1	1	1	1	1	1
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

etc,

To facilitate sending magnitude commands in the SCATHA operational environment it was necessary to give each command to be used a number and of course there was a limit on the number of numbers available. Appendix B is the result of that operational constraint and it is called the command list. The command list includes latching commands as well as magnitude commands. Magnitude commands start at command #7100.

Bit Utilization for 22 Bit Serial Command

FIGURE 2.4-1

22	CBUS 1	Data	2 ⁰	9 255	
21	CBUS 2		2 ¹		
20	CBUS 3		2 ²		
19	CBUS 4		2 ³		
18	CBUS 5		2 ⁴		
17	CBUS 6		2 ⁵		
16	CBUS 7		2 ⁶		
15	CBUS 8		2 ⁷		
14	A0 = MC9	Address	2 ⁰	0 15	
13	A1 = MC10		2 ¹		
12	A2 = MC11		2 ²		
11	A3 = MC12		2 ³		
10	= MC13				
9	= MC14				
8	PCE				
7	PARITY				
6	X = Don't Care				
5	X = Don't Care				
4	X = Don't Care				
3	X = Don't Care				
2	X = Don't Care				
1	X = Don't Care				

TABLE 2.4-1

COMMAND SUMMARY

BINARY ADDRESS A ₃ A ₂ A ₁ A ₀	OCTAL ADDRESS	DECIMAL ADDRESS	STROBE NAME	FORTH TEST NAME	DESCRIPTION
0 0 0 0	0 0	0	STNSLL	NSLL	Data on CBUS is strobed into NS lower limit register
0 0 0 1	0 1	1	STNSUL	NSUL	Data on CBUS is strobed into NS upper limit register
0 0 1 0	0 2	2	STEWLL	EWLL	Data on CBUS is strobed into EW lower limit register
0 0 1 1	0 3	3	STEWUL	EWUL	Data on CBUS is strobed into EW upper limit register
0 1 0 0	0 4	4	STNSPS	NSPS	Data on CBUS is strobed into NS position register
0 1 0 1	0 5	5	STEWPS	EWPS	Data on CBUS is strobed into EW position register
0 1 1 0	0 6	6	STDT	DT	Data on CBUS is strobed into dwell time register
0 1 1 1	0 7	7	ST DN	DN	Data on CBUS is strobed into dwell number register
1 0 0 0	1 0	8	STID1	ID1	Data on CBUS is strobed into initial dwell step register
1 0 0 1	1 1	9	STDS	DS	Data on CBUS is strobed into dwell step size register
1 0 1 0	1 2	10	STAG	AG	Data on CBUS is strobed into accumulator gating register
1 1 0 1	1 3	11	STMP	MP	Data on CBUS is strobed into motor power register
1 1 0 0	1 4	12	STROBE 12		
1 1 0 1	1 5	13	STROBE 13		
1 1 1 0	1 6	14	STROBE 14		
1 1 1 1	1 7	15	---		

As can be seen from table 2.4-1 there are 12 different address's into which 8 bits of data can be strobed.

The first six addresses (NSLL, NSUL, EWLL, EWUL, NSPS, and EWPS) are used to transfer control bits into the position programmer which controls the rotation of the detector assemblies.

The next four addresses (DT, DN, ID1, AND DS) are used to transfer data into the deflection voltage programmer which determines the scan/dwell program and ultimately the energy of the particles to be analyzed.

The eleventh address (AG) is utilized to control the flow of data from each sensor to the accumulators 1-6 and the 3KHZ channel. In addition, a control bit for the electron suppressor voltage for the high energy detector is included.

Finally, the twelfth address (MP) is utilized to control the power to the motors and the mode of operation of the 3KHZ Channel.

POSITION PROGRAMMER

The position programmer has two identical sections. One section controls the NSRDA (High Energy Dectector) and the other controls the position of the EWRDA (Low Energy Detector).

NSLL	
NSUL	CONTROLS ROTATION OF NSRDA
NSPS	
EWLL	
EWUL	CONTROLS ROTATION OF EWRDA
EWPS	

See Figure 2.5-1 for Angle Definition

SC9 RELAY COMMAND SUMMARY

TABLE 2.4-2

COMMAND NO.	NAME	TYPE	FUNCTIONAL DESCRIP.	MEAS. NO.	NAME	TLN VALUE																																																																								
7000	SC9 POWER ON	L	Applied +28V non-critical bus to SC9 low voltage power supply.	J4016	PCUMON	.92+.06VDC																																																																								
7001	SC9 POWER OFF	U	Removes +28V non-critical bus from SC9 low voltage power supply.	J4016	PCUMON	.03+.06VDC																																																																								
7002	NS DEFLECTION VOLTAGE INHIBIT (DVINS)	L	Inhibits deflection voltage NSRDA	NOTE: TO VERIFY COMMAND STATUS OF LATCHING CMDS 7002, 7003, 7004, 7011, 7012, 7013, 7020 USE FIG. A. LATCHING COMMAND WILL SET A "1" IN THE APPROPRIATE BIT POSITION, UNLATCH CMDS WILL RESET THE CORRESPONDING BITS TO ZERO.																																																																										
				J8545	(LSB)																																																																									
7003*	EW DEFLECTION VOLTAGE INHIBIT (DVIEW)	L	Intended to inhibit deflection voltage EWRDA	<table><tr><td>BIT</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td></tr><tr><td>N</td><td>7</td><td>7</td><td>7</td><td>7</td><td>7</td><td>7</td><td>7</td><td>7</td></tr><tr><td>O</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>T</td><td>2</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>U</td><td>0</td><td>3</td><td>2</td><td>1</td><td>4</td><td>3</td><td>2</td><td></td></tr><tr><td>S</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>E</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>D</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>			BIT	8	7	6	5	4	3	2	1	N	7	7	7	7	7	7	7	7	O	0	0	0	0	0	0	0	0	T	2	1	1	1	0	0	0	0	U	0	3	2	1	4	3	2		S									E									D								
BIT	8	7	6	5	4	3	2	1																																																																						
N	7	7	7	7	7	7	7	7																																																																						
O	0	0	0	0	0	0	0	0																																																																						
T	2	1	1	1	0	0	0	0																																																																						
U	0	3	2	1	4	3	2																																																																							
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7004*	FD DEFLECTION VOLTAGE INHIBIT (DVIFD)	L	Intended to inhibit deflection voltage FDA	<table><tr><td>N</td><td>7</td><td>7</td><td>7</td><td>7</td><td>7</td><td>7</td><td>7</td><td>7</td></tr><tr><td>O</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>T</td><td>2</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>U</td><td>0</td><td>3</td><td>2</td><td>1</td><td>4</td><td>3</td><td>2</td><td></td></tr><tr><td>S</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>E</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>D</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>			N	7	7	7	7	7	7	7	7	O	0	0	0	0	0	0	0	0	T	2	1	1	1	0	0	0	0	U	0	3	2	1	4	3	2		S									E									D																	
N	7	7	7	7	7	7	7	7																																																																						
O	0	0	0	0	0	0	0	0																																																																						
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U	0	3	2	1	4	3	2																																																																							
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				FIGURE A LC:1-7																																																																										
7005	UNLATCH COMMANDS 7002, 7003, 7004	U	Removes deflection voltage inhibit function from NS, EW, FD.	J8545	LC:1-7	See Fig. A.																																																																								
7011	NS SPIRALTRON VOLTAGE ON	L	ON/OFF switch NSRDA spiraltron voltage	J8545	LC:1-7	See Fig. A.																																																																								

Table 2.4-2 Cont.

37

SC9 RELAY COMMAND SUMMARY

Table 2.4-2 cont.

7035	UNLATCH CMDS 7030, 7031	U	Unlatches 7030 and 7031	"	"	"
7040**	MICROPRO- CESSOR BYPASS	L	Intended as a switch to enable microprocessor.	J8552	LC:8-14	See Fig. B
7041**	MICROPROCES- SOR OFF	L	Intended as ON/OFF switch microprocessor supply.	"	"	"
7045	UNLATCH 7040, 7041	U	Unlatches 7040 and 7041	"	"	"

* - Changing the EWRDA and FDA to low energy detectors eliminated the need for these commands.

** - The unavailability of the microprocessor eliminated the need for these commands. IMPORTANT NOTE: If 7040 is logical one SC9 will not respond to magnitude commands.

SERIAL COMMAND FUNCTIONS

TABLE 2.4-3

COMMAND NO.	NAME	FUNCTIONAL DESCRIPTION	TELEMETRY RESPONSE		
			MEAS NO.	NAME	TLM VALUE
7100-7279	NSLL Reversal Angle	Programs NS head lower limit register (NSLL) value entered determines NS lower limit head reversal angle. Reversal angles (deg) from -17-60 to +232 in 1.4 increments can be programmed.	J8510	NSLL	Each bit count change of J8510 corresponds to a reversal angle change of 1.4 starting at -17 -60. Thus when J8510=1; $\omega = -17.6^\circ$ J8510=2; $\omega = -16.2^\circ$ ↓ ↓ J8510=180; $\omega = 233.0^\circ$
7280-7281	Forced Reversal Angle, NSLL	Forces NS head to change direction (from to) immediately, irrespective of angular position	J8510	NSLL	0 (7280) 255 (7291)
7282-7461	NSUL	Programs NS head upper limit register. Programmable values are same as those for NSLL.	J8511	NSUL	Same as NSLL verification, except use J8511.
7462-7463	Forced Reversal Angle, NSUL	Forces NS head to change direction (from to) immediately, irrespective of angular position.	J8511	NSUL	0 (7462) 255 (7463)
7464-7643	EWLL	Programs EW head lower limit register. Programmable values are same as NSLL.	J8512	EWLL	Same as NSLL verification except use J8512.
7464-7645	Forced Reversal Angle, EWLL	Forces EW head to change direction (from to) immediately, irrespective of angular position.	J8512	EWLL	0 (7462) 255 (7463)
7646-7825	EWUL	Programs EW head upper limit register. Programmable values are same as NSLL.	J8513	EWUL	Same as NSLL verification, except use J8513.

SERIAL COMMAND FUNCTIONS

Table 2.4-3 cont.

7826-7827	Forced Reversal Angle, EWUL	Forces EW head to change direction (from to) immediately, irrespective of angular position.	J8513 EWUL 0 (7826) 255 (7827)
7828	NS Park Immediate	Stops NS head rotation	J8569 NSPS 0000, DCNTS
7829	NS Park at 90°	Command NS head to the +90° park position.	J8569 NSPS 160, DCNTS J4017 NSPOS 2.16+.05VDC J8506 NSPC 308+20, DCNTS
7830	NS Sweep	Command NS head to sweep between its optical limits (-20.4° to +220.8°)	J8569 NSPS 164, DCNTS J4017 NSPOS -20° +220° .54 4.46V J8506 NSPC 0000 0627
7831	NS Park at -20°	Commands NS head to the -20° park position	J8569 NSPS 165, DCNTS J4017 NSPOS .72+.06VDC J8506 NSPC 0000, DCNTS
7832	NS Park at 0°	Commands NS head to the 0° park position	J8569 NSPS 166, DCNTS J4017 NSPOS .96+.06VDC J8506 NSPC 48+, DCNTS
7833	NS park at 180°	Commands NS head to the 180° park position	J8569 NSPS 172, DCNTS J4017 NSPOS 3.88+.06VDC J8506 NSPC 565+, DCNTS
7834	NS park at 200°	Commands NS head to the 200° park position	J8569 NSPS 180, DCNTS J4017 NSPOS 4.10, VDC J8506 NSPC 627+ DCNTS
7835	NS Wag	Commands NS head to wag between NSLL and NSUL.	J8569 NSPS 228, DCNTS J4017 NSPOS Limits are dependant on NSLL, NSUL set. J8506 NSPC "
7836	EW park immediate	Stops EW head rotation	J8570 EWPS 0000, DCNTS
7837	EW park at +90°	Commands EW head to +90° park position	J8570 EWPS 160, DCNTS J4018 EWPOS 2.20+.06, VDC J8507 EWPC 312+, DCNTS
7838	EW sweep	Commands EW had to sweep between its optional limits -20.40° to +220.8°	J8570 EWPS 164, DCNTS J4018 EWPOS -20° +220° .54 4.44VDC J8507 EWPC 0000 0630, DCNTS
7839	EW park at -20°	Commands EW head to -20° park position	J8570 EWPS 165, DCNTS J4018 EWPOS .54+.06, VDC

SERIAL COMMAND FUNCTIONS

Table 2.4-3 cont.

7840	EW park at 0°	Commands EW head to 0° park position	J8507 EWPS 0000,DCNTS J8570 EWPS 166,DCNTS J4018 EWPOS .74+.06,VDC J8507 EWPC 49+,DCNTS
7841	EW park at 180°	Commands EW head to the 180° park position	J8570 EWPS 172,DCNTS J4018 EWPOS 4.14+.06,VDC J8507 EWPC 566+,DCNTS
7842	EW park at 200°	Commands EW head to the 200° park position	J8570 EWPS 180,DCNTS J4018 EWPOS 4.46+.06,VDC J8507 EWPC 630+,DCNTS
7843	EW Wag	Commands EW head to wag between EWLL and EWUL.	J8570 EWPS 228,DCNTS J4018 EWPOS Limits are dependant on EWLL, EWUL values. J8507 EWPC "
7844	Scan only		
7845-7908	Dwell Time (DT)	Sets deflection program dwell time Dwell times of 64 seconds to 1 second can be programmed.	J8532 DT Each bit change of J8532 corresponds to a dwell time (DT) change of 1 seconds starting at 128CNTS. Thus when: J8532=128;DT=64 J8532=129;DT=63 1 1 J8532=191;DT=1
7909-7972	Dwell Time (DT)		
7973-8004	Start Dwell number (DN)	Selects number of dwell periods (DN) that will occur in one deflection program cycle. DN values from 64 dwells/cycle to 2 dwells/cycle in increments of 2 can be programmed.	J8533 DN Each bit change of J8533 corresponds to a dwell number change of 2 dwells/cycle starting at 64 dwells/cycle. Thus when: J8533=0;DN=64 dwells/cycle J8533=1;DN=62 dwells/cycle J8533=63;DN=2

SERIAL COMMAND FUNCTIONS

Table 2.4-3 cont.

				dwells/cycle
8005-8036	Preset dwell	Presets the DN register with required DN. Values of 64 dwells/cycle to 2 dwells/cycle can be present. This command will force the start of a new deflection program cycle.	J8533 DN	Same verifications as for "start dwell" command described above.
8037-8100	Initial Step(ID1)	Selects the initial dwell step value of the deflection program. Values ranging from 0-63 can be programmed in increments of 1.	J8534 ID1	Each bit change corresponds to an initial dwell step (ID1) change of 1, starting at 0. Thus when: J8534=0;ID1=0 J8534=1;ID1=1 ↓ J8534=63;ID1=63
8101-8106	Dwell Step Size(DS)	Selects the dwell step size of the deflection programs. DS values of 1, 2, 4, 8, 16, 32 can be programmed.	J8535 DS	Decimal count value in J8535 gives the dwell step size. Thus when: J8533=1;DS=1 ↓ J8533=32;DS=32
8107-8234	Accumulator Gating	Determined data mode by selecting one mode of each of the following SC9 data functions	J8538 AG	CMD J8538 8101 0 8108 1 8109 2 ↓ 8234 127
		<u>FUNCTION</u> <u>SELECTABLE MODES</u>		
		3KHz gate PNS,ENS,PEW, broadband EEW,PFIX,DISABLE data		
		Low energy On,Off mode		
	Accumulator gating	Normal, fast proton fast electron, SFPNS, SFPEW, SFEEW, SFPFIX		
		Refer to command list to determine modes selected by each command.		

SERIAL COMMAND FUNCTIONS

Table 2.4-3 cont.

8235-8282	Motor Power
8283	NS Position Status, 255
8284	EW Position Status, 255
8287	Dwell Step Size=0
8288	Dwell Step Size=255
8289	Accumulator Gating=255
8290	Motor Power =255
8291-8297	

2.5 COMMAND MODES

Due to constraints on the operation of the SCATHA spacecraft, all possible commands cannot be sent in all possible modes. Also the anticipated times to be able to send commands are limited. Faced with this serious inconvenience, the experimenters have been asked to define a subset of useful modes in which to place their instruments. This subset can then exist on the tracking computer disks. A matrix showing possible transitions between these defined modes then indicates the most efficient way of changing from one to another. The ground rules were that no more than 6-10 modes would be defined for any instrument. In the case of SC-9, this has been a severe burden. The instrument was designed to be "flown" in near real time and to be very flexible. However, the following modes have been defined and implemented. They represent a very useful subset of what is possible. Command state outside of those designated here would have to be implemented by defining a command string and having that placed on the disk before the desired satellite pass. The execution of this new command could be scheduled in the same manner as the normal states. The predicted minimum time to design and implement such a new mode is two weeks. Exceptions can be made to support real-time operation (in support of SC-4 for instance).

Note that certain of the magnitude commands can be varied to define different operating conditions within a given mode.

Modes are implemented by automated execution of command sequences. These sequences are indicated in the allowed-disallowed transition matrix. The exact definition of the sequences are also given.

UCSD/SCATHA SC9 AURORAL PARTICLES EXPERIMENT

MODE SUMMARY

MODE NO.	MODE TITLE	POWER CONSUMPTION (NOMINAL + OPER RANGE)	-CONSTRAINTS-
0	OFF/SAFE	0	SC9-CON-2 SC9-CON-3
1	SCAN/SWEEP	15.56 + 3	SC9-CON-01
2	SCAN/DWELL/SWEEP	15.56 $\pm$ 3	SC9-CON-01
3	SCAN/PARK	7.56 $\pm$ 3 AFTER PARK	SC9-CON-01
4	SCAN/DWELL/PARK	7.56 $\pm$ 3 AFTER PARK	SC9-CON-01
5	FAST MIX	7.56 + 3 IF PARK 15.56 $\pm$ 3 IF SWEEP	SC9-CON-01
6	SAFE MODE 2	7.56 $\pm$ 3	

UCSD/SCATHA SC9 AURORAL PARTICLES EXPERIMENT

MODE TRANSITION MATRIX

"A" - Allowable Transition. For each Allowable Transition, write appropriate sequence number in box.

"D" - Disallowed Transition

	TO	MODE-0 OFF/ SAFE	MODE-1 SCAN/ SWEEP	MODE-2 SCAN/ DWELL/ SWEEP	MODE-3 SCAN/ PARK	MODE-4 SCAN/ DWELL/ PARK	MODE-5 FAST MIX	MODE-6 SAFE MODE 2
FROM								
MODE-0			D	A SC9CMD-1	D	D	D	A SC9CMD-9
MODE-1	A SC9CMD-2			A SC9CMD-3	A SC9CMD-4	D	D	A SC9CMD-9
MODE-2	A SC9CMD-2	A SC9CMD-5			D	A SC9CMD-4	A SC9CMD-6	A SC9CMD-9
MODE-3	A SC9CMD2	A SC9CMD-7	D			A SC9CMD-3	D	A SC9CMD-9
MODE-4	A SC9CMD-2	D	A SC9CMD-7	A SC9CMD-5			D	A SC9CMD-9
MODE-5	A SC9CMD-2	D	A SC9CMD-8	D	D			A SC9CMD-9
MODE-6	A SC9CMD-2	D	A SC9CMD-1	D	D	D		

UCSD/SCATHA SC9 AURORAL PARTICLES EXPERIMENT

COMMAND SEQUENCE SUMMARY

COMMAND SEQUENCE	BLOCK NO.	COMMAND SEQUENCE FUNCTION OR DESCRIPTION	TRANSITION FROM MODE	TO MODE
SC9-CMD-1	B-7050	TURN ON - SET MODE 2	0	2
SC9-CMD-2	B-7060	OFF	1, 2, 3, 4, 5, 6	0
SC9-CMD-3	B-7051	TURN DWELL ON	1 3	2 4
SC9-CMD-4	B-7052	TURN PARK ON	1 2	3 4
SC9-CMD-5	B-7053	TURN DWELL OFF	2 4	1 3
SC9-CMD-6		FAST MIX ON	2	5
SC9-CMD-7		TURN PARK OFF	3 4	1 2
SC9-CMD-8		FAST MIX OFF	5	2
SC9-CMD-9	B-7061	TO SAFEMODE 2	0, 1, 2, 3, 4, 5	6
SC9-CMD-10		SC9 CHECKOUT SEQUENCE	NA	NA

2.5.1 Detector Rotation

NSRDA ROTATION CONTROL (High Energy Detector)

Data transferred to NSPS control register will control the rotation of the High Energy Detector as shown in Table 2.5-1. There are eight modes of operation:

Park Immediate-	Detector will stop immediately upon execution of cmd. 7828 (0 NSPS)
Park 90 Deg.-	Detector will park at 90 Deg. the next time it gets there after the execution of cmd. 7829 (160 NSPS)
Park -20 Deg.-	Detector will park at -20 Deg. the next time it gets there after the execution of cmd. 7831 (165 NSPS)
Park 0 Deg.-	Detector will park at 0 Deg. the next time it gets there after the execution of cmd. 7832 (166 NSPS)
Park 180 Deg.-	Detector will park at 180 Deg. the next time it gets there after the executions of cmd. 7833 (172 NSPS)
Park 200 Deg.-	Detector will park at 200 Deg. the next time it gets there after the execution of cmd. 7834 (180 NSPS)
SWEEP	Detector will sweep between optical limits approximately 200 Deg. after the execution of cmd. 7830 (164 NSPS)
WAG	Detector will rotate between the lower and upper limit. Limits are established by NSLL and NSUL for the high energy detector. Wag will commence after the execution of cmd. 7835 (228 NSPS)

NORTH SOUTH ROTATION CONTROL

TABLE 2.5-1

MAG. CMD. #	NSPS DATA DEC.	NSPS DATA BINARY								NSPS DATA DEC.	NORTH SOUTH DETECTOR WILL:	
		XXX NSE	NS WAG	NS SWP	NSP 200	NSP 180	NSP 90	NSP 0	NSP -20			
7828	0	0	0	0	0	0	0	0	0	0	PARK IMMEDIATE	
	.	.	.	.	.	.	.	.	.	.	"	"
	.	.	.	.	.	.	.	.	.	.	"	"
	127	0	1	1	1	1	1	1	1	127	"	"
7829	160	1	0	1	0	0	0	0	0	160	Park at 90 Degrees	
7830	164	1	0	1	0	0	1	0	0	164	Sweep between optical limits	
7831	165	1	0	1	0	0	1	0	1	165	Park at -20 Degrees	
7832	166	1	0	1	0	0	1	1	0	166	Park at 0 Degrees	
7833	172	1	0	1	0	1	1	0	0	172	Park at 180 Degrees	
7834	180	1	0	1	1	0	1	0	0	180	Park at 200 Degrees	
7835	228	1	1	1	0	0	1	0	0	228	Wag between upper and lower limit	

SC9 - NS SWEEP ANGLE VS POSITION COUNTER

TABLE 2.5-2

UCSD/SCATHA SC9 AURORAL PARTICLES EXPERIMENT
NSRDA (HIGH ENERGY)

SWEEP ANGLE VS POSITION COUNTER AND ANALOG PERFORMANCE MONITOR

TNS= 3.63 TEW= 3.62 TMB= 3.66

POSITION NSRDA COUNTER ROTATION NSPC ANGLE		ANALOG PERFORMANCE NUMBER		NSPC		NSP		NSPC		NSP	
J8506	α°	J4017	J8506	α°	J4017	J8506	α°	J4017	J8506	α°	J4017
0	-19.53	0.74	100	+15.35	1.16	200	+50.23	1.60			
4	-18.14	0.76	104	+16.75	1.18	204	+51.63	1.64			
8	-16.74	0.78	108	+18.14	1.18	208	+53.02	1.66			
12	-15.35	0.80	112	+19.53	1.20	212	+54.42	1.68			
16	-13.95	0.82	116	+20.93	1.20	216	+55.81	1.70			
20	-12.56	0.84	120	+22.32	1.22	220	+57.21	1.72			
24	-11.16	0.88	124	+23.72	1.24	224	+58.60	1.76			
28	-9.77	0.90	128	+25.11	1.24	228	+60.00	1.78			
32	-8.37	0.92	132	+26.51	1.26	232	+61.39	1.80			
36	-6.98	0.94	136	+27.90	1.28	236	+62.79	1.82			
40	-5.58	0.96	140	+29.30	1.30	240	+64.19	1.84			
44	-4.18	0.98	144	+30.69	1.32	244	+65.58	1.86			
48	-2.79	1.00	148	+32.09	1.34	248	+66.98	1.90			
52	-1.39	1.02	152	+33.49	1.38	252	+68.37	1.92			
56	0.0	1.02	156	+34.88	1.38	256	+69.77	1.94			
60	+1.39	1.04	160	+36.30	1.40	260	+71.16	1.96			
64	+2.79	1.04	164	+37.67	1.42	264	+72.56	1.98			
68	+4.19	1.06	168	+39.06	1.44	268	+73.95	2.00			
72	+5.58	1.08	172	+40.46	1.46	272	+75.35	2.02			
76	+6.98	1.10	176	+41.86	1.48	276	+76.74	2.04			
80	+8.37	1.12	180	+43.25	1.50	280	+78.14	2.08			
84	+9.97	1.12	184	+44.65	1.52	284	+79.53	2.10			
88	+11.16	1.14	188	+46.04	1.54	288	+80.93	2.12			
92	+12.56	1.16	192	+47.44	1.56	292	+82.32	2.14			
96	+13.95	1.16	196	+48.83	1.58	296	+83.72	2.16			

TABLE 2.5-2

(CONTINUED)

NSPC J8506	α°	NSP J4017	NSPC J8506	α°	NSP J4017	NSPC J8506	α°	NSP J4017
300	+85.12	2.20	400	+120.00	2.74	500	+154.88	3.42
304	+86.51	2.22	404	+121.39	2.76	504	+156.28	3.46
308	+87.90	2.24	408	+122.79	2.78	508	+157.67	3.50
312	+89.30	2.26	412	+124.19	2.80	512	+159.06	3.52
316	+90.70	2.30	416	+125.58	2.82	516	+160.46	3.56
320	+92.09	2.30	420	+126.98	2.86	520	+161.86	3.60
324	+93.49	2.32	424	+128.37	2.88	524	+163.25	3.62
328	+94.88	2.34	428	+129.77	2.90	528	+164.65	3.66
332	+96.28	2.36	432	+131.16	2.92	532	+166.05	3.70
336	+97.67	2.38	436	+132.56	2.96	536	+167.44	3.74
340	+99.07	2.40	440	+133.95	2.98	540	+168.84	3.76
344	+100.46	2.44	444	+135.35	3.00	544	+170.23	3.82
348	+101.86	2.44	448	+136.74	3.04	548	+171.63	3.84
352	+103.26	2.48	452	+138.14	3.08	552	+173.02	3.86
356	+104.65	2.50	456	+139.53	3.10	556	+174.42	3.90
360	+106.05	2.50	460	+140.93	3.12	560	+175.81	3.94
364	+107.44	2.54	464	+142.33	3.14	564	+177.21	3.98
368	+108.83	2.56	468	+143.72	3.18	568	+178.60	4.00
372	+110.23	2.58	472	+145.12	3.20	572	+180.00	4.00
376	+111.62	2.60	476	+146.51	3.22	576	+181.39	4.04
380	+113.02	2.62	480	+147.90	3.26	580	+182.79	4.08
384	+114.42	2.66	484	+149.30	3.30	584	+184.17	4.08
388	+115.81	2.66	488	+150.70	3.32	588	+185.58	4.12
392	+117.21	2.70	492	+152.09	3.36	592	+186.98	4.14
396	+118.60	2.72	496	+153.49	3.40	596	+188.37	4.14

TABLE 2.5-2 (CONTINUED)

NSPC J8506	α°	NSP J4017
600	+189.76	4.16
604	+191.16	4.16
608	+192.56	4.18
612	+193.95	4.18
616	+195.34	4.20
620	+196.74	4.22
624	+198.14	4.22
628	+199.53	4.22

EWRDA ROTATION CONTROL (Low Energy Detector)

Data transferred to EWPS control register will control the rotation of the Low Energy Detector as shown in Table 2.5.2-3. There are eight modes of operation:

- Park Immediate- Detector will stop immediately upon execution of of cmd. 7836 (0 EWPS)
- Park 90 Deg.- Detector will park at $(90 + 22.5)$ Deg. the next time it gets there after the execution of cmd. 7837 (160 EWPS)
- Park -20 Deg.- Detector will park at $(-20 + 22.5)$ Deg. the next time it gets there after the execution of cmd. 7839 (165 EWPS)
- Park 0 Deg.- Detector will park at $(0 + 22.5)$ Deg. the next time it gets there after the execution of cmd. 7840 (166 EWPS)
- Park 180 Deg.- Detector will park at $(180 + 22.5)$ Deg. the next time it gets there after the execution of cmd. 7841 (172 EWPS)
- Park 200 Deg.- Detector will park at $(200 + 22.5)$ Deg. the next time it gets there after the execution of cmd. 7842 (180 EWPS)
- Sweep- Detector will sweep between optical limits approximately 220 Degrees after the execution of cmd. 7838 (164 EWPS)
- Wag- Detector will rotate between the lower and upper limit. Limits are established by EWLL and EWUL for the Low Energy Detector. Wag will commence after the execution of cmd. 7843 (228 EWPS)

TABLE 2.5-3

EAST WEST ROTATION CONTROL

MAG. CMD. #	EWPS DATA DEC.	EWPS DATA BINARY								EWPS DATA DEC.	EAST WEST DETECTOR WILL:
		EW	EW	EWP	EWP	EWP	EWP	EWP	EWP		
		WAG	SWP	200	180	90	0	-20			
7836	0	0	0	0	0	0	0	0	0	0	PARK IMMEDIATE
.	.	.	.	.	.	.	.	.	.	.	" "
.	.	.	.	.	.	.	.	.	.	.	" "
127	0	1	1	1	1	1	1	1	1	127	" "
7837	160	1	0	1	0	0	0	0	0	160	Park at (90 + 22.5) degrees
7839	164	1	0	1	0	0	1	0	0	164	Sweep between optical limits
7839	165	1	0	1	0	0	1	0	1	165	Park at (-20 + 22.5) degrees
7840	166	1	0	1	0	0	1	1	0	166	Park at (0 + 22.5) degrees
7841	172	1	0	1	0	1	1	0	0	172	Park at (180 + 22.5) degrees
7842	180	1	0	1	1	0	1	0	0	180	Park at (200 + 22.5) degrees
7843	228	1	1	1	0	0	1	0	0	228	Wag between upper and lower limit

TABLE 2.5-4

UCSD/SCATHA SC9 AURORAL PARTICLES EXPERIMENT
EWRDA (LOW ENERGY)

SWEEP ANGLE VS POSITION COUNTER AND ANALOG PERFORMANCE MONITOR

TNS= 3.63 TEW= 3.62 TMB= 3.66

POSITION EWRDA COUNTER ROTATION EWP J8507		ANALOG PERFORMANCE MONITOR EWP J4018		EWP J8507		EWP J8507		EWP J4018	
J8507		J4018		J8507		J8507		J4018	
0	-19.53	0.56	100	+15.35	0.96	200	+50.23	1.48	
4	-18.14	0.56	104	+16.75	1.00	204	+51.63	1.50	
8	-16.74	0.58	108	+18.14	1.00	208	+53.02	1.54	
12	-15.35	0.60	112	+19.53	1.02	212	+54.42	1.56	
16	-13.95	0.62	116	+20.93	1.04	216	+55.81	1.58	
20	-12.56	0.64	120	+22.32	1.04	220	+57.21	1.60	
24	-11.16	0.66	124	+23.72	1.06	224	+58.60	1.62	
28	-9.77	0.66	128	+25.11	1.08	228	+60.00	1.66	
32	-8.37	0.68	132	+26.51	1.10	232	+61.39	1.68	
36	-6.98	0.70	136	+27.90	1.12	236	+62.79	1.70	
40	-5.58	0.72	140	+29.30	1.14	240	+64.19	1.72	
44	-4.18	0.74	144	+30.69	1.16	244	+65.58	1.76	
48	-2.79	0.76	148	+32.09	1.18	248	+66.98	1.78	
52	-1.39	0.78	152	+33.49	1.20	252	+68.37	1.80	
56	0.0	0.78	156	+34.88	1.22	256	+69.77	1.82	
60	+1.39	0.80	160	+36.30	1.24	260	+71.16	1.86	
64	+2.79	0.82	164	+37.67	1.26	264	+72.56	1.88	
68	+4.19	0.84	168	+39.06	1.30	268	+73.95	1.90	
72	+5.58	0.84	172	+40.46	1.32	272	+75.35	1.92	
76	+6.98	0.88	176	+41.86	1.34	276	+76.74	1.96	
80	+8.37	0.90	180	+43.25	1.36	280	+78.14	1.98	
84	+9.77	0.92	184	+44.65	1.38	284	+79.53	2.00	
88	+11.16	0.94	188	+46.04	1.40	288	+80.93	2.04	
92	+12.56	0.96	192	+47.44	1.44	292	+82.32	2.06	
96	+13.95	0.96	196	+48.83	1.46	296	+83.72	2.64	

Table 2.5-4 (CONTINUED)

EWPC J8507	♦	EWP J4018	EWPC J8507	♦	EWP J4018	EWPC J8507	♦	EWP J4018
300	+85.12	2.10	400	+120.00	2.66	500	+154.88	3.48
304	+86.51	2.14	404	+121.39	2.68	504	+156.28	3.52
308	+87.90	2.16	408	+122.79	2.72	508	+157.67	3.56
312	+89.30	2.18	412	+124.19	2.74	512	+159.06	3.60
316	+90.70	2.20	416	+125.58	2.76	516	+160.46	3.64
320	+92.09	2.24	420	+126.98	2.80	520	+161.86	3.68
324	+93.49	2.26	424	+128.37	2.82	524	+163.25	3.72
328	+94.88	2.28	428	+129.77	2.86	528	+164.65	3.76
332	+96.28	2.30	432	+131.16	2.88	532	+166.05	3.80
336	+97.67	2.32	436	+132.56	2.90	536	+167.44	3.84
340	+99.07	2.34	440	+133.95	2.94	540	+168.84	3.88
344	+100.46	2.36	444	+135.35	2.98	544	+170.23	3.92
348	+101.86	2.38	448	+136.74	3.02	548	+171.63	3.98
352	+103.26	2.38	452	+138.14	3.04	552	+173.02	4.02
356	+104.65	2.42	456	+139.53	3.08	556	+174.42	4.06
360	+106.05	2.44	460	+140.93	3.12	560	+175.81	4.10
364	+107.44	2.46	464	+142.33	3.14	564	+177.21	4.14
368	+108.83	2.48	468	+143.72	3.18	568	+178.60	4.16
372	+110.23	2.50	472	+145.12	3.20	572	+180.00	4.22
376	+111.62	2.52	476	+146.51	3.24	576	+181.39	4.24
380	+113.02	2.54	480	+147.90	3.28	580	+182.79	4.28
384	+114.42	2.56	484	+149.30	3.32	584	+184.17	4.32
388	+115.81	2.60	488	+150.70	3.36	588	+185.58	4.34
392	+117.21	2.62	492	+152.09	3.40	592	+186.96	4.36
396	+118.60	2.64	496	+153.49	3.44	596	+188.37	4.40

Table 2.5-4 (CONTINUED)

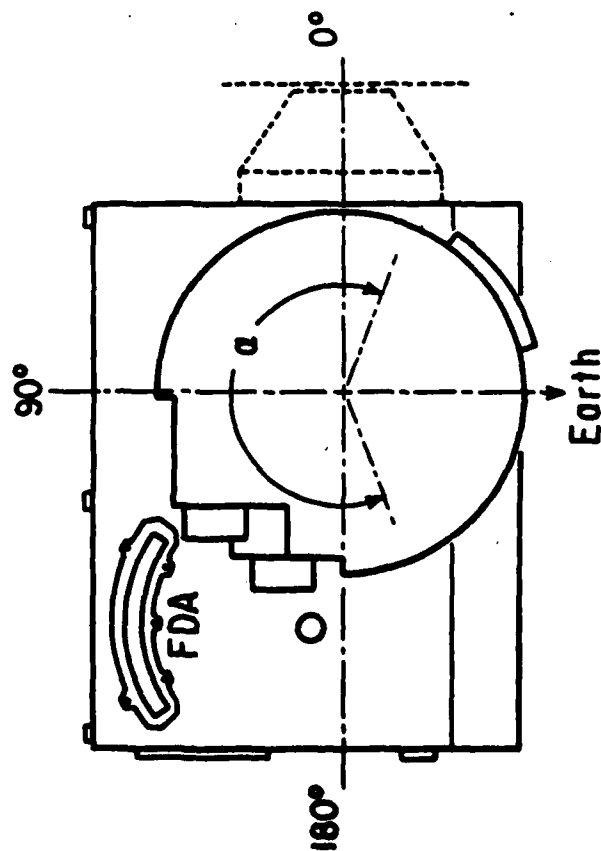
EWPC EWP
J8507 J4018

600	+189.76	4.42
604	+191.16	4.44
608	+192.56	4.46
612	+193.95	4.46
616	+195.34	4.48
620	+196.74	4.50
624	+198.14	4.52
628	+199.53	4.52

SCATHA SC-9

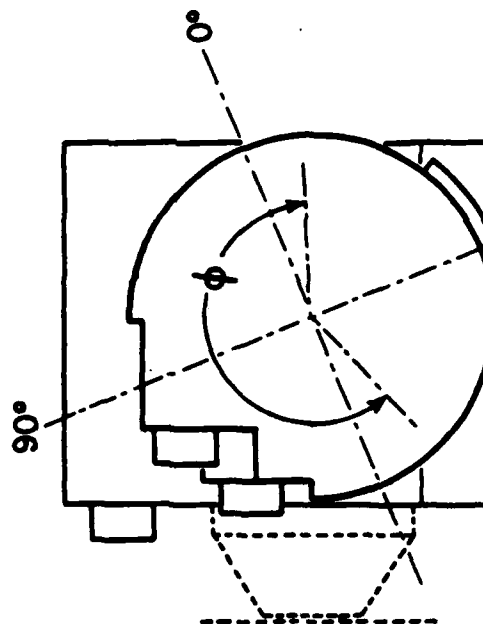
NSRDA

EWRDA



α Increasing: CCW Rotation

α Decreasing: CW Rotation



ϕ Increasing: CCW Rotation

ϕ Decreasing: CW Rotation

Figure 2.5-1

ANGLE DEFINITION

Table 2.5-2 summarizes detector rotation angle vs position counter and analog performance monitor for NSRDA.

Table 2.5-4 summarizes detector rotation angle vs position counter and analog performance monitor for EWRDA.

2.5.2 Detector Energy Levels

DEFLECTION VOLTAGE PROGRAMMER

Scan - The simplest energy program available is called scan. In this program, the analyzer scans sequentially through 64 discrete exponentially spaced energy levels. The program starts at the lowest energy level E0 and proceeds to the highest energy level E63. Each energy level is maintained for 250 ms before proceeding to the next energy level. Transition time between energy levels is assumed to be negligible. The scan only mode of operation is simply a mode in which the analyzer energy is controlled by consecutive scan programs. Execution of magnitude command number 7844 will cause all of the electrostatic analyzer's to operate in the scan only mode.

Scan-Dwell Program - This program starts with a single scan as described above. At the completion of the scan the analyzer will then jump to a predetermined energy level ID1 (one of the 64 scan energy levels) and maintain that energy level (DWELL) for a predetermined length of time DT. At the completion of the dwell the analyzer will perform a scan program and then dwell at the next dwell energy level $E(ID1 + DS)$, where DS is the number of discrete energy levels or steps between adjacent dwells of the same scan dwell program. This process continues until a predetermined number of dwells (ND) have occurred at which time the program repeats.

The following parameters define the scan dwell program and are controllable by magnitude commands:

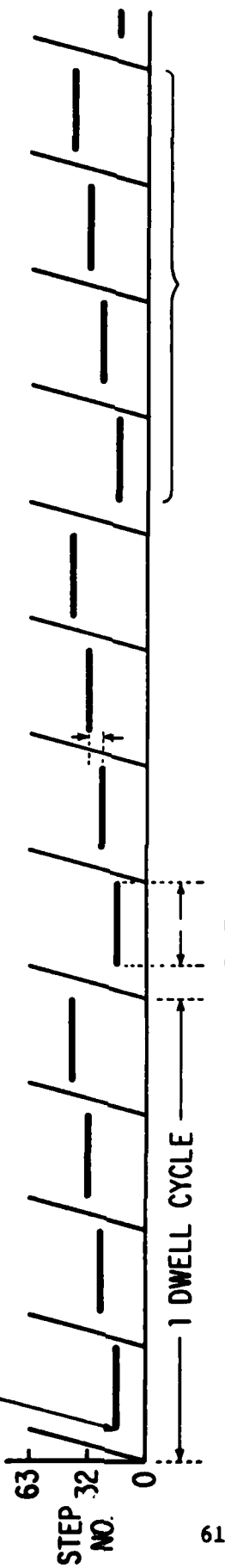
MAGNITUDE COMMAND	PARAMETER	DEFINITION
# 7845-7972	DT	The length of time each dwell is maintained
7973-8036	DN	The number of dwells in a scan-dwell program
8037-8100	ID1	The initial dwell energy level of a scan dwell program
8101-8106 8291-8297	DSS	The number of discrete energy levels between adjacent dwells of the same program

Figure 2.5-2 illustrates typical scan and scan dwell programs.

INITIAL DWELL STEP

ID1

CMD NO'S
8037-8100



NUMBER OF DWELLS

PER CYCLE

DN

CMD NO'S

7973-8036

DWELL STEP SIZE

DSS

CMD NO'S

8101-8106

8291-8297

DWELL TIME

DT

CMD NO'S

7845-7972

Figure 2.5-2

TYPICAL SCAN DWELL PROGRAM

DETECTOR ENERGY

NOMINAL VALUE

The power supply which drives the plates of the detector's energy analyzer can be programmed to supply any one of 64 voltage steps. (see page 5 of the current SC-9 Handbook for more information on the energy analyzer) Nominally, the voltage applied to the plates should be: $E_0 = -21 + 16.1 * (1.145 ** S)$ where S is the desired energy step. A graph of the $\log_{10}(\text{energy applied})$ vs step number is provided.

CORRECTIONS

In the high energy detectors, (North-South detectors) the actual voltage of the analyzer is not the nominal voltage E_0 . One must also take into account a temperature dependent transient response voltage which occurs following the transition from a high energy step to a low energy step.

Whenever the voltage of the analyzers drops from a high value to a low value, a voltage offset occurs. Normally, this happens during the transition from a scan period to a dwell period. This offset voltage behaves unpredictably for the first 1/4 to 1/2 seconds after the transition, and then decays away with a $1/(t+c)$ response. Because of the beginning unpredictability, the first few data points after the transition are thrown out. The transient response of the offset voltage then causes the energy analyzer to slowly sweep down through

higher voltages than originally intended.

In order to compensate for this extra voltage, a correction to the nominal energy value, E_0 , must be made. The form of this correction is:

$$E(\text{total energy of analyzer}) = E_0 + C1[1/(4t+C2) + 1/(4 * \text{dwell time} + C3) - 1/C4],$$

where:

$C1$ is of the form: $A + B \exp(C * T)$, with:

$$A = 18.3$$

$$B = 0.43$$

$$C = 0.06$$

T = temperature in degrees centigrade

$4t$ = $4 * \text{time since transition.}$

= number of steps since end of scan

For all dwell lengths:

$$C2 = 1$$

$$C3 = 65$$

$$C4 = 97$$

This $E(\text{total})$ is computed for all dwell lengths, and for both scan/dwell and scan only modes. NOTE: The last two terms of $E(\text{total})$ cancel for dwell periods of 8 seconds.

Finally, when the preceding dwell is at a high energy step, a fourth term becomes important in determining the energy during the

following scan period. Again, the transition is from a high energy step to a low energy step, but now it is from the end of a dwell to the beginning of a scan. This fourth term is:

$$E3 = [[-21 + 16.1 * (1.145 ** (\text{dwell step})) / 81557] * [C1 / (S + 1)]$$

where S is the energy step number.

Thus, the total energy during a scan is equal to:

$$E(\text{total}) = E_0 + C1[1/(4t+1) + 1/(4t+ 65) - 1/97] + E3$$

Note: E3 is not added in during a dwell period.

As E3 is very small if the dwell energy step is low, it is always computed and added in during all scan periods except when the instrument is in the scan only mode.

The constants A,B and C in the C1 correction value were determined using NS Electron data. During a very low energy dwell, the analyzer energy will sweep through the photoelectron spike and a C1 value can be chosen to fit the dwell spectrum to the scan spectrum which follows it. This fit was done for three different temperatures: 8,13 and 17 degrees centigrade, which seems to be a typical temperature spread of the detector heads. The above form of C1 as a function of temperature was assumed, and the constants were solved for algebraically. Unfortunately, as the temperature spread is small, the accuracy of A,B and C is hard to determine.

HIGH ENERGY DETECTOR

Typical values for E0-E63 for electrons and ions for the scan following a 32 second dwell are given in Table 2.5-6 . The energy equation is included with the table. A nominal room temperature C1 value has been choosen. Table 2.5-5 summarizes energy analyzed versus dwell step number and accumulation interval with C1 again taken as the nominal room temperature value.

LOW ENERGY DETECTOR

Typical values for E0-E63 for electrons and ions for the low energy detector are given in Table 2.5-7 .

TABLE 2.5-5
HIGH ENERGY DETECTOR
ENERGY ANALYZED VS DWELL STEP NO.
AND ACCUMULATION INTERVAL

E = -21 + 16.1(1.145 * S) + 26.7(M-1)
E FOR LOW ENERGY DWELL 14 SCAN-DWELL CYCLE (ROOM TEMP)

N	0	1	2	3	4	5	6	7	8	9	10	11
1	4.433	6.760	9.441	12.291	16.086	20.018	24.613	29.073	35.094	42.793	50.020	59.731
2	2.100	4.434	7.108	10.106	13.672	17.685	22.279	27.540	33.563	40.468	48.396	57.368
3	.700	3.034	5.708	8.706	12.272	16.285	20.970	26.440	32.163	39.068	46.956	55.908
4	-.243	2.101	4.774	7.835	11.339	15.352	19.246	25.206	31.238	38.126	46.023	55.065
5	-.900	1.434	4.108	7.168	10.672	14.685	19.279	24.540	30.563	37.468	45.356	54.398
6	-1.400	.934	3.608	6.668	10.172	14.185	18.779	24.040	30.063	36.968	44.856	53.898
7	-1.789	.546	3.219	6.279	9.784	13.796	18.390	23.651	29.674	36.571	44.467	53.509
8	-2.100	.214	2.908	5.968	9.472	13.485	18.079	23.340	29.363	36.260	44.156	53.198
9	-2.355	-.020	2.653	5.714	9.218	13.230	17.825	23.085	29.109	36.005	43.912	52.943
10	-2.567	-.242	2.441	5.501	9.006	13.018	17.613	22.873	28.896	35.793	43.690	52.731
11	-2.746	-.412	2.261	5.322	8.826	12.839	17.433	22.694	28.717	35.614	43.510	52.552
12	-2.900	-.565	2.100	5.160	8.672	12.685	17.279	22.540	28.563	35.468	43.356	52.398
13	-3.033	-.699	1.974	5.035	8.539	12.552	17.146	22.406	28.438	35.326	43.223	52.265
14	-3.158	-.816	1.858	4.918	8.422	12.435	17.024	22.298	28.313	35.210	43.104	52.148
15	-3.253	-.910	1.755	4.815	8.320	12.332	16.924	22.207	28.210	35.107	43.013	52.045
16	-3.344	-1.010	1.663	4.724	8.228	12.241	16.835	22.093	28.119	35.015	42.912	51.954
17	-3.426	-1.092	1.581	4.642	8.146	12.159	16.753	22.013	28.037	34.933	42.831	51.872
18	-3.500	-1.166	1.509	4.560	8.072	12.085	16.679	21.948	27.963	34.868	42.756	51.798
19	-3.567	-1.232	1.441	4.501	8.006	12.018	16.613	21.873	27.896	34.793	42.690	51.731
20	-3.627	-1.293	1.380	4.441	7.945	11.950	16.552	21.813	27.836	34.732	42.629	51.671
21	-3.683	-1.343	1.325	4.385	7.890	11.902	16.497	21.757	27.780	34.677	42.574	51.615
22	-3.733	-1.399	1.274	4.335	7.839	11.852	16.446	21.706	27.738	34.626	42.523	51.565
23	-3.788	-1.446	1.229	4.288	7.792	11.805	16.396	21.660	27.683	34.580	42.476	51.518
24	-3.823	-1.489	1.184	4.245	7.749	11.762	16.356	21.617	27.640	34.537	42.433	51.475
25	-3.863	-1.528	1.145	4.205	7.710	11.722	16.316	21.577	27.600	34.497	42.393	51.435
26	-3.900	-1.566	1.108	4.168	7.672	11.685	16.279	21.548	27.563	34.468	42.354	51.398
27	-3.934	-1.600	1.076	4.134	7.638	11.650	16.245	21.525	27.529	34.425	42.322	51.364
28	-3.967	-1.632	1.041	4.101	7.606	11.618	16.213	21.473	27.496	34.393	42.298	51.331
29	-3.997	-1.662	1.011	4.071	7.576	11.588	16.181	21.443	27.466	34.363	42.260	51.301
30	-4.025	-1.691	.983	4.043	7.547	11.568	16.154	21.415	27.438	34.335	42.231	51.273
31	-4.052	-1.717	.956	4.017	7.521	11.533	16.128	21.388	27.412	34.304	42.205	51.247
32	-4.076	-1.742	.931	3.992	7.496	11.509	16.103	21.363	27.387	34.283	42.180	51.222
33	-4.100	-1.766	.906	3.968	7.472	11.485	16.079	21.340	27.363	34.264	42.159	51.198
34	-4.122	-1.784	.885	3.946	7.450	11.463	16.057	21.318	27.341	34.237	42.134	51.176
35	-4.143	-1.809	.864	3.925	7.429	11.442	16.036	21.297	27.320	34.216	42.113	51.155
36	-4.163	-1.829	.844	3.905	7.409	11.422	16.016	21.277	27.300	34.197	42.093	51.135
37	-4.182	-1.846	.825	3.886	7.390	11.403	15.997	21.258	27.281	34.178	42.074	51.116
38	-4.200	-1.866	.808	3.868	7.372	11.385	15.979	21.240	27.263	34.160	42.056	51.098
39	-4.217	-1.883	.790	3.851	7.355	11.368	15.962	21.223	27.246	34.143	42.039	51.081

TABLE 2.5-6
TYPICAL VALUES FOR EO - E63
FOR
HIGH ENERGY DETECTOR

E = $-21 + 16.1 \cdot (1.145 \cdot S) + 28.7 \cdot (10^{-1})$
32 SECOND DUEIL : M = 120 : 3 (ROOM TEMP)

S	E	•	•	•	•	•	•	•	•
0	-4.68	•	•	22	295.81	•	•	43	5417.45
1	-2.35	•	•	23	341.72	•	•	44	6206.80
2	.32	•	•	24	394.29	•	•	45	7188.89
3	3.38	•	•	25	454.49	•	•	46	8142.70
4	6.88	•	•	26	521.39	•	•	47	9326.41
5	10.89	•	•	27	602.30	•	•	48	10681.76
6	15.49	•	•	28	692.65	•	•	49	12233.63
7	20.75	•	•	29	796.11	•	•	50	14010.53
8	26.77	•	•	30	914.56	•	•	51	16045.88
9	33.66	•	•	31	1050.19	•	•	52	18374.64
10	41.56	•	•	32	1205.49	•	•	53	21041.98
11	50.68	•	•	33	1383.30	•	•	54	24096.09
12	60.95	•	•	34	1586.90	•	•	55	27593.05
13	72.88	•	•	35	1820.02	•	•	56	31997.06
14	86.37	•	•	36	2086.94	•	•	57	36181.66
15	101.91	•	•	37	2392.57	•	•	58	41431.82
16	119.71	•	•	38	2742.51	•	•	59	47441.54
17	140.88	•	•	39	3143.19	•	•	60	54323.58
18	163.41	•	•	40	3601.97	•	•	61	62263.53
19	198.12	•	•	41	4127.28	•	•	62	71226.86
20	228.70	•	•	42	4728.76	•	•	63	81556.86
21	255.72								

TABLE 2.5-7

TYPICAL VALUES E0 - E63
FOR LOW ENERGY DETECTOR

Step #	Energy in EV	Step #	Energy in EV
0	-0.334	32	26.26
1	-0.29	33	30.10
2	-0.23	34	34.57
3	-0.16	35	39.70
4	-0.08	36	45.55
5	0.00	37	52.22
6	0.09	38	60.00
7	0.22	39	68.77
8	0.34	40	78.55
9	0.50	41	90.10
10	0.67	42	103.32
11	0.87	43	118.32
12	1.10	44	135.65
13	1.36	45	155.43
14	1.66	46	178.09
15	2.00	47	203.98
16	2.39	48	233.42
17	2.83	49	267.20
18	3.34	50	306.30
19	3.94	51	350.74
20	4.60	52	401.96
21	5.37	53	457.73
22	6.25	54	525.50
23	7.25	55	601.05
24	8.40	56	687.71
25	9.72	57	787.70
26	11.23	58	902.13
27	12.96	59	1033.23
28	14.96	60	1184.33
29	17.23	61	1355.42
30	19.83	62	1529.85
31	22.8	63	1777.60

2.6 ACCUMULATOR GATING

The magnitude command AG controls three features of the SC9 experiment:

- 1) controls flow of data into the 3KHZ channel
- 2) controls the electron suppressor voltage on the High Energy Detector as described in section 2.2-1
- 3) controls flow of data from each of the five detectors into the six accumulators.

3KHZ Gating- The flow of data into the 3KHZ Channel is controlled by magnitude command AG as follows;

MAGNITUDE COMMAND NUMBER	INPUT DATA TO 3KHZ CHANNEL
8107 THRU 8122	ION DATA HIGH ENERGY DETECTOR (PNS)
8123 THRU 8138	ELECTRON DATA HIGH ENERGY DETECTOR (ENS)
8139 THRU 8154	ION DATA LOW ENERGY DETECTOR (PEW)
8155 THRU 8170	ELECTRON DATA LOW ENERGY DETECTOR (EEW)
8171 THRU 8186	ION DATA FIXED DETECTOR (PFIX)

Electron Suppressor Voltage High Energy Detector-As described in section 2.3.1.

Accumulator gating - There are eight modes of accumulator gating. During scan in any of the modes, the data is always routed the same way. During dwell, the accumulator assignments change and the accumulation intervals change. Table 2.6-1 and 2.6-2 summarizes the contents of the six accumulators vs. mode. Finally, the logic equations for the accumulator gating is presented in figure 2.6-1.

TABLE 2.6-1

ACCUMULATOR GATING

5/13/76 - EWS
Rev. 10/9/76

MAGNITUDE COMMAND NUMBER	ACCUMULATOR COMMANDS AGO AG1 AG2			MODE NOMENCLATURE ACC. TIME MS	CONTENTS OF ACC # DURING SCAN					
	OCTAL	0	0	0	1	2	3	4	5	6
8107, 8115, ..., 8227	0	0	0	0	Normal T	PNS 234	EWS 234	PEN 234	EEN 234	FFIX 117
8108, 8116, ..., 8228	1	1	0	0	Fast Ion T	PNS 234	EWS 234	PEN 234	EEN 234	FFIX 117
8109, 8117, ..., 8229	2	0	1	0	Fast Mix T	PNS 234	EWS 234	PEN 234	EEN 234	FFIX 117
8110, 8118, ..., 8230	3	1	1	0	SPFNS T	PNS 234	EWS 234	PEN 234	EEN 234	FFIX 117
8111, 8119, ..., 8231	4	0	1	1	SPENS T	PNS 234	EWS 234	PEN 234	EEN 234	FFIX 117
8112, 8120, ..., 8232	5	1	0	1	SPFEN T	PNS 234	EWS 234	PEN 234	EEN 234	FFIX 117
8113, 8121, ..., 8233	6	0	1	1	SPENH T	PNS 234	EWS 234	PEN 234	EEN 234	FFIX 117
8114, 8122, ..., 8234	7	1	1	1	SPFFIX T	PNS 234	EWS 234	PEN 234	EEN 234	FFIX 117

MEASUREMENT NO.'s

J	J	J	J	J	J	J
4	4	4	4	4	4	4
5	5	5	5	5	5	5
0	0	0	0	0	0	0
1	6	2	7	3	8	8

CONTENTS OF ACC # DURING DWELL					
1	2	3	4	5	6
PNS 249.99	EWS 249.99	PEN 249.99	EEN 249.99	FFIX 124.99	FFIX 125
PNS 124.99	PNS 125	PEN 124.99	PEN 125	FFIX 124.99	FFIX 125
PNS 124.99	PNS 125	EWS 124.99	EWS 125	EEN 124.99	EEN 125
PNS 62.5	PNS 62.5	PNS 62.5	PNS 62.5	EWS 249.99	PEN 249.99
EWS 62.5	EWS 62.5	EWS 62.5	EWS 62.5	PNS 249.99	EEN 249.99
PEN 62.5	PEN 62.5	PEN 62.5	PEN 62.5	EEN 249.99	PNS 249.99
EEN 62.5	EEN 62.5	EEN 62.5	EEN 62.5	PEN 249.99	EWS 249.99
FFIX 62.5	FFIX 62.5	FFIX 62.5	FFIX 62.5	PNS 249.99	PEN 249.99

J	J	J	J	J	J
4	4	4	4	4	4
5	5	5	5	5	5
0	0	0	0	0	0
1	6	2	7	3	8

ACCUMULATOR INFORMATION

7/12/77

TABLE 2.6-2

MEASUREMENTS	ACCUMULATOR		D W E L L												
	MONICIAITURE	SCAN	M0-H7	M0	M1	M2	M3	M4	M5	M6	M7				
J4501	ACC #1 DATA		PNS	PNS	PNS	PNS	PNS	PNS	PNS	PNS	PNS				
	ACI	2-31	S12	S8.S12	S8.S12	S8.S12	S4.S12	S4.S12	S4	S4	S4				
	T in ms	234	249.99	124.99	124.99	124.99	62.59	62.49	62.49	62.49	62.49				
	XFR	S10	S10	S10	S10	S10	S10	S10	S10	S10	S10				
	RESET	S11	S11	S11	S11	S11	S11	S11	S11	S11	S11				
ODD SUBFRAMES TELEMETRY WORDS 104,105															
J4566	ACC #2 DATA		PNS	PNS	PNS	PNS	PNS	PNS	PNS	PNS	PNS				
	ACI	2-31	S12	S9	S9	S9	S5	S5	S5	S5	S5				
	T in ms	234	249.99	125.00	125.00	125.00	62.5	62.5	62.5	62.5	62.5				
	XFR	S10	S10	S10	S10	S10	S10	S10	S10	S10	S10				
	RESET	S11	S11	S11	S11	S11	S11	S11	S11	S11	S11				
EVEN SUBFRAMES TELEMETRY WORDS 104,105															
J4502	ACC #3 DATA		PNS	PNS	PNS	PNS	PNS	PNS	PNS	PNS	PNS				
	ACI	2-31	S12	S8.S12	S8.S12	S8.S12	S6	S6	S6	S6	S6				
	T in ms	234	249.99	124.99	124.99	124.99	62.5	62.5	62.5	62.5	62.5				
	XFR	S10	S10	S10	S10	S10	S10	S10	S10	S10	S10				
	RESET	S11	S11	S11	S11	S11	S11	S11	S11	S11	S11				
ODD SUBFRAMES TELEMETRY WORDS 49,50															
J4567	ACC #4 DATA		PNS	PNS	PNS	PNS	PNS	PNS	PNS	PNS	PNS				
	ACI	2-31	S12	S9	S9	S9	S7	S7	S7	S7	S7				
	T in ms	234	249.99	125.00	125.00	125.00	62.5	62.5	62.5	62.5	62.5				
	XFR	S10	S10	S10	S10	S10	S10	S10	S10	S10	S10				
	RESET	S11	S11	S11	S11	S11	S11	S11	S11	S11	S11				
EVEN SUBFRAMES TELEMETRY WORDS 49,50															
J4503	ACC #5 DATA		PNS	PNS	PNS	PNS	PNS	PNS	PNS	PNS	PNS				
	ACI	2-16	S8.S12	S8.S12	S8.S12	S8.S12	S12	S12	S12	S12	S12				
	T in ms	117	124.99	124.99	124.99	124.99	249.99	249.99	249.99	249.99	249.99				
	XFR	S10	S10	S10	S10	S10	S10	S10	S10	S10	S10				
	RESET	S11	S11	S11	S11	S11	S11	S11	S11	S11	S11				
ODD SUBFRAMES TELEMETRY WORDS 51,52															
J4568	ACC #6 DATA		PNS	PNS	PNS	PNS	PNS	PNS	PNS	PNS	PNS				
	ACI	17-31	S9	S9	S9	S9	S12	S12	S12	S12	S12				
	T in ms	117	125	125	125	125	249.99	249.99	249.99	249.99	249.99				
	XFR	S10	S10	S10	S10	S10	S10	S10	S10	S10	S10				
	RESET	S11	S11	S11	S11	S11	S11	S11	S11	S11	S11				
EVEN SUBFRAMES TELEMETRY WORDS 51,52															

ACCUMULATOR GATING LOGIC EQUATIONS

May 19, 1976
E. W. Strein

- 1) $X = (M3.PNS + M4.ENS + M5.PEW + M6.KEW + M7.PFIX)$
- 2) $Y = (M3.ENS + M4.PNS + M5.KEW + M6.PEW + M7.PNS)$
- 3) $Z = (M3.PEW + M4.KEW + M5.PNS + M6.ENS + M7.PEW)$
- 4) $ACC \#1 = PNS.(S1.SCAN + \overline{S12.M0.DWELL}) + DWELL. [(M1 + M2).PNS.S8.\overline{S12} + S4.\overline{S12}.(X)]$
- 5) $ACC \#2 = ENS.(S1.SCAN + \overline{S12.M0.DWELL}) + DWELL. [(M1 + M2).PNS.S9 + S5.(X)]$
- 6) $ACC \#3 = PEW.(S1.SCAN + \overline{S12.M0.DWELL}) + DWELL. [(M1.PEW + M2.ENS).S8.\overline{S12} + S6.(X)]$
- 7) $ACC \#4 = KEW.(S1.SCAN + \overline{S12.M0.DWELL}) + DWELL. [(M1.PEW + M2.ENS).S9 + S7.(X)]$
- 8) $ACC \#5 = PFIX.(S2.SCAN + S8.\overline{S12.M0.DWELL}) + DWELL. [(M1.PFIX + M2.KEW).S8.\overline{S12} + \overline{S12}.Y]$
- 9) $ACC \#6 = PFIX.(S3.SCAN + S9.M0.DWELL) + DWELL. [(M1.PFIX + M2.KEW).S9 + \overline{S12}.Z]$

Figure 2.6-1

Data Interpretation - The serial readout of ACC1-6 are assigned measurement numbers as follows:

ACCUMULATOR #	MEASUREMENT #
1	J4501
2	J4566
3	J4502
4	J4567
5	J4503
6	J4568

The bit assignment and interpretation of the above measurements are presented in the following three pages.

ACCUMULATOR 1

MEASUREMENT # J4501

EVER MAIN FRAMES

WORD 105															
2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
AC1-14	AC1-13	AC1-12	AC1-11	AC1-10	AC1-9	AC1-8	AC1-7	AC1-6	AC1-5	AC1-4	AC1-3	AC1-2	AC1-1	AC1-0	AC1-15

AC1-15 is the MSB of accumulator one (2¹⁵)

AC1-0 is the LSB of accumulator one (2⁰)

To interpret J4501 as the number of counts stored in accumulator one, rotate J4501 right one bit. To obtain the following 16 bit number:

AC1-15	AC1-14	AC1-13	AC1-12	AC1-11	AC1-10	AC1-9	AC1-8	AC1-7	AC1-6	AC1-5	AC1-4	AC1-3	AC1-2	AC1-1	AC1-0
--------	--------	--------	--------	--------	--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

ACCUMULATOR 2

MEASUREMENT # J4566

ODD MAIN FRAMES

WORD 105															
2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
AC2-14	AC2-13	AC2-12	AC2-11	AC2-10	AC2-9	AC2-8	AC2-7	AC2-6	AC2-5	AC2-4	AC2-3	AC2-2	AC2-1	AC2-0	AC2-15

AC2-15 is the MSB of accumulator two (2¹⁵)

AC2-0 is the LSB of accumulator two (2⁰)

To interpret J4566 as the number of counts stored in accumulator two, rotate J4566 right one bit to obtain the following 16 bit number:

AC2-15	AC2-14	AC2-13	AC2-12	AC2-11	AC2-10	AC2-9	AC2-8	AC2-7	AC2-6	AC2-5	AC2-4	AC2-3	AC2-2	AC2-1	AC2-0
--------	--------	--------	--------	--------	--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

MEASUREMENT # J4502

ACCUMULATOR 3

EVEN MAIN FRAMES

WORD 49															WORD 50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				

AC3-15 is the MSB of accumulator three (2¹⁵)

AC3-0 is the LSB of accumulator three (2⁰)

To interpret J4502 as the number of counts stored in accumulator three rotate J4502 right one bit to obtain the following 16 bit number:

AC3-15	AC3-14	AC3-13	AC3-12	AC3-11	AC3-10	AC3-9	AC3-8	AC3-7	AC3-6	AC3-5	AC3-4	AC3-3	AC3-2	AC3-1	AC3-0
--------	--------	--------	--------	--------	--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

MEASUREMENT # J4567

ACCUMULATOR 4

ODD MAIN FRAMES

WORD 49															WORD 50				
2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰				
AC4-14	AC4-13	AC4-12	AC4-11	AC4-10	AC4-9	AC4-8	AC4-7	AC4-6	AC4-5	AC4-4	AC4-3	AC4-2	AC4-1	AC4-0	AC4-15				

AC4-15 is the MSB of accumulator four (2¹⁵)

AC4-0 is the LSB of accumulator four (2⁰)

To interpret J4567 as the number of counts stored in accumulator four, rotate J4567 right one bit to obtain the following 16 bit number:

AC4-15	AC4-14	AC4-13	AC4-12	AC4-11	AC4-10	AC4-9	AC4-8	AC4-7	AC4-6	AC4-5	AC4-4	AC4-3	AC4-2	AC4-1	AC4-0
--------	--------	--------	--------	--------	--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

MEASUREMENT # J4503

ACCUMULATOR 3

EVEN MAIN FRAMES															
WORD 51								WORD 52							
2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
ACS-14	ACS-13	ACS-12	ACS-11	ACS-10	ACS-9	ACS-8	ACS-7	ACS-6	ACS-5	ACS-4	ACS-3	ACS-2	ACS-1	ACS-0	ACS-15

ACS-15 is the MSB of accumulator five (2¹⁵)

ACS-0 is the LSB of accumulator five (2⁰)

To interpret J4503 as the number of counts stored in accumulator five, rotate J4503 right one bit to obtain the following 16 bit number:

ACS-15	ACS-14	ACS-13	ACS-12	ACS-11	ACS-10	ACS-9	ACS-8	ACS-7	ACS-6	ACS-5	ACS-4	ACS-3	ACS-2	ACS-1	ACS-0
--------	--------	--------	--------	--------	--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

MEASUREMENT # J4568

ACCUMULATOR 6

ODD MAIN FRAMES															
WORD 51								WORD 52							
2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
ACS-14	ACS-13	ACS-12	ACS-11	ACS-10	ACS-9	ACS-8	ACS-7	ACS-6	ACS-5	ACS-4	ACS-3	ACS-2	ACS-1	ACS-0	ACS-15

ACS-15 is the MSB of accumulator six (2¹⁵)

ACS-0 is the LSB of accumulator six (2⁰)

To interpret J4568 as the number of counts stored in accumulator six, rotate J4568 right one bit to obtain the following 16 bit number:

ACS-15	ACS-14	ACS-13	ACS-12	ACS-11	ACS-10	ACS-9	ACS-8	ACS-7	ACS-6	ACS-5	ACS-4	ACS-3	ACS-2	ACS-1	ACS-0
--------	--------	--------	--------	--------	--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

2.7 GEOMETRIC CONVERSION FACTOR

Based on geometric considerations and on preliminary comparisons with other experiments on ATS-6, the geometric factor (G) for ions is:

$$G = 16 * 10^{**}(-4) \text{ cm cm ster} \\ = (\text{aperture area}) * (\text{aperture solid angle})$$

The value of G for electrons is one half of this, as one half of the electron aperture is covered to help prolong the sensor's life. This is necessary because the electron sensors are subject to much higher counting rates than the ion sensors.

The conversion factor (H), used in determining the differential energy flux, (where $\text{diff. E flux} = \text{cnt rate}/H$) is:

$$H = 3.2 * 10^{**}(-4) \text{ cm cm ster ev/ev for ions.}$$

Where:

$$H = G * \text{Energy Bandwidth} \\ = \Delta(A) * \Delta(\Omega) * \Delta(E)/E \\ = G * 0.2$$

The H factor has energy dependent corrections at low energies due to:

1) The post analysis acceleration of particles which occurs between the lens and the spiraltron. This acceleration causes factors of three variations in H which occur gradually around 1-3 keV for ions and about 0.1-0.3 keV for electrons. There are also some changes when

the secondary suppressor is turned off. (the suppressor can be turned off between 0-100 eV on the high energy detector head, and between 0-22 eV on the low energy detector head)

2) The 0.1-0.2 volt noise level on the high energy analyzing plates and the 0.01-0.02 volt noise on the low energy plates. For the high energy analyzer, the plate noise becomes important below 5 eV., while for the low energy analyzer it is important below 0.1 eV.

H also has corrections in the electron data at higher energies due to the variations of the spiraltron efficiency with energy.

Figure (to be created) shows the results of the combined correction of H, Eff(lens) and Eff(spiraltron) on the raw count rate.

The mono-energetic angular resolution of the orthogonal planes of each detector is about 2.5 degrees for the narrow plane and 5 degrees for the wide plane. These angular resolutions spread by a factor of two for a full spectrum of energies.

3.0 DATA FORMATS & PROCESSING

3.1 SCATHA COMMON BLOCKS

CONTROLS AND FLAGS

COMMON/UNITS/ - Assigns logical devices to actual devices.

ITD = tape drive for input tape (MT2: or MT3:)

ITU = logical unit for tape

IOUT = logical unit for picture file on disk

LABEL = logical unit for label file on disk

IDEV = disk drive for picture and label files (DB1: or DB0:)

IPU = logical unit for lists of files one through four

COMMON/CALCE (CALculate ENergy) - Contains the M value and energy value for each .25 second time interval. M is the number of energy steps since the end of the last energy scan.

MVALUE = M value for each .25 second interval

EHIGH = NS detector temperature corrected energy value for each .25 seconds

ELOW = EW detector temperature corrected energy value for each .25 second.

M = current M value

PRSP = previous energy step

PRPRSP = previous, previous energy step

COMMON/OPCL/ (OPen, CLose)- Contains the information that routines SCOPEN and SCCLOS use to open and close disk files.

COMMON/TAPCOM/ - Contains the event flag and status words in which RTAPE (RTAPE is the routine which reads a given tape) returns the status of the tape read. (See COMMON/STATUS for more info. about status)

COMMON/BUFFER/ - Contains buffers where RTAPE puts the records from tape.

DATA

COMMON/COUNTS/ - Contains the raw counts and accumulator gatings. In NORMAL MODE of operations, the accumulator assignments are:

IACC1 = NS Ions (sampled every .25 second)
IACC2 = NS Electrons (sampled every .25 second)
IACC3 = EW Ions (sampled every .25 second)
IACC4 = EW Electrons (sampled every .25 second)
IACC5 = Fixed Ions (sampled every .125 second)
IAG = Accumulator gating

NOTE: IACC does not equal the variable ACCX found in subroutine CTRT. see COMMON/CTRT/ for more information on IACC and ACCX.

UN-NORMAL MODES - Each of the accumulators can be used to sample different directions and particles than it normally does. This enables one particular form of data to be sampled more often. These un-normal modes occur only during dwell cycles, not during scan. See page 70 of the current SC-9 Handbook for a listing of all modes and their commands.

COMMON/CTRT/ (Count Rate) - Contains the count rate (counts per second) as generated by CRATE. (CRATE computes dead-time, background and bias corrected count rates)

NOTE: Raw data from the tape is put into integer variables IACC1-5. These raw counts are then converted by CRATE into floating point count rates and put into variables ACC1-5. Then, in order to list the count rates without a decimal they are converted to double precision integer format and put into variables DACC1-5. DACC1-5 are equivalenced to ACC1-5 in subroutine PRPROC.

ACCX = counts per second in Real format

DACCX = counts per second in Integer format

COMMON/DISTRB/ - Contains the calculated distribution functions for the

five detectors.

DFNSEL = Distribution Function, NS Electrons

DFNSIO = Distribution Function, NS Ions

DPEWEL = Distribution Function, EW Electrons

DPEWIO = Distribution Function, EW Ions

DPPXIO = Distribution Function, Fixed Ions

COMMON/MAG/ - Contains the raw Magnetometer data. X,Y,Z coarse and fine values and the direction of the X,Y, Z vectors.

COMMON/MAGCS/ - Contains the X,Y and Z coordinates of the Magnetic Field in the Magnetometer's coordinate system. It also contains the magnitude of the total vector and of the vector in the X,Y plane.

MAGX = X component of magnetic field

MAGY = Y component of magnetic field

MAGZ = Z component of magnetic field

MAGTOT = magnitude of the total X,Y,Z vector

MAGPER = magnitude of the X,Y vector (this is the plane
perpendicular to the spin axis)

COMMON/ROTATE/ - Contains rotational information.

NSP = NS detector analog position

IEWP = EW detector analog position

NSPC = NS detector position counter

IEWPC = EW detector position counter

ICWNS = counter clockwise NS detector. It equals 1 if
NS detector moving CCW, equals 0 if moving CW.

ICWEW = counter clockwise EW detector. It equals 1 if
EW detector moving CCW, equals 0 if moving CW.

NSLL = NS detector position lower limit (validity of data
not yet checked)

NSUL = NS detector position upper limit (validity of data
received not yet checked)

IEWLL = EW detector position lower limit (validity of data
received not yet checked)

IEWUL = EW detector position upper limit (validity of data
received not yet checked)

NSPS = NS detector park, sweep wag (validity of data
received not yet checked)

IEWPS = EW detector park, sweep wag (validity of data
received not yet checked)

COMMON/PROBEV/ - contains probe voltages from SC-2 experiment. (validity
of data received not yet determined)

COMMON/SC10/ - Contains field data from SC10 experiment. (validity of data
received not yet checked)

IEC1-4 = electric channels 1-4
IMC1-4 = magnetic channels 1-4
IPC1 = + calibration verification
INC1 = - calibration verification
MCNV = magnetometer common mode
MODE = mode

COMMON/SC4E - Contains electron gun data from SC-4 experiment. Validity of data checked by R.C.O. 1980. (See COMMON/SC4I/ for more information)

IBCF = beam current flags 1-5
IBON = beam on/off
IBDCF = beam duty cycle flag
IBFF1-2 = beam focus flags 1-2
IBCH = beam current high
IHVM = high voltage monitor
IBEF = beam energy flags 1-4
IVM1-2 = voltage monitor 1-2

COMMON/SC4I/ - Contains ion gun data from SC-4 experiment. Validity of data checked by R.C.O. 1980. (See COMMON/SC4E for more information)

IBCM = beam current monitor
NE = neutralizer emission
ISNCM = satellite positive ion system (SPIBS) net current monitor

IDCUR = discharge current
IBVM = beam voltage monitor
KCM = keeper current monitor
KHVM = keeper high voltage monitor
IACM = accelator current monitor
IDCM = decelerator current monitor
NHCM = neutralizer htr current monitor
NBVM = neutralizer bias voltage monitor

COMMON/SOLAR/ - Contains solar array currents. Validity of data checked by R.C.O. 1980.

COMMON/TIMEN/ - Contains time and the variables to be used in energy calculations.

IGT = ground time in milliseconds
IDC = deflection control counter (energy step number)
ITNS = temperature NS detector head
ITEW = temperature EW detector head
ITMB = temperature of Motor Box
ITPCU = temperature of Power Cond. unit
IMP = motor power

NOTE: The validity of the data contained in the following variables

has not yet been determined.

IDN = number of dwells per cycle

ID1 = initial dwell step

IDT = dwell time

IDS = dwell step size

COMMON/STATUS/ - Contains the status of Latching and Magnitude commands. For a description of the Latching commands see page 16 of the current SC-9 Handbook. (see page 14 for spiraltron bias voltage) The last command sent to the instrument is used to determine its status.

. LC1 = status Latching commands 1-7. These give status of commands 7002-7020.

LC2 = status Latching commands 8-14. These give status of commands 7021-7041.

MC1 = status of the Magnitude commands 1-8. Magnitude commands start with command number 7100.

MC2 = status of the Magnitude commands 8-14. Magnitude commands start with command number 7100.

COMMON/SUBCID/ - contains the subcommand Id, one byte for each eighth of a second.

COMMON/VOLT/ - Contains deflection and spiraltron voltages. The selected energy step equals a fudge factor multiplied by the deflection voltage.

IDV(1) = + deflection voltage NS detector
IDV(3) = + deflection voltage EW detector
IDV(5) = + deflection voltage Fixed detector
IDV(2) = - deflection voltage NS detector
IDV(4) = - deflection voltage EW detector
IDV(6) = - deflection voltage Fixed detector

NOTE: The above variables contain the true voltage on the spiraltron assembly plates. They are outputted every 16 seconds and can be used to check the C1 Correction. One voltage variable is for the top plate of the spiraltron assembly and the other is for the bottom plate.

ISV(1) = spiraltron voltage NS detector
ISV(2) = spiraltron voltage EW detector
ISV(3) = spiraltron voltage Fixed detector

ORBIT ATTITUDE DATA

COMMON/PITCHA/ - Contains pitch angle information.

PAPXD = Fixed detector pitch angle computed every .25 second

PAEWD = EW detector pitch angle computed every .25 second

PANSND = NS detector pitch angle computed every .25 second

NOTE: The following variables are computed every second.

LVSNSX = look vector, space craft frame, NS detector, X coordinate

LVSNSY = look vector, space craft frame, NS detector, Y coordinate

LVSEWX = look vector, space craft frame, EW detector, X coordinate

LVSEWY = look vector, space craft frame, EW detector, Y coordinate

LVSEWZ = look vector, space craft frame, EW detector, Z coordinate

LVSPXX = look vector, space craft frame, Fixed detec, X coordinate

LVSPXY = look vector, space craft frame, Fixed detec, Y coordinate

LVSPXZ = look vector, space craft frame, Fixed detec, Z coordinate

DANS = detector angle, NS detector

DAEW = detector angle, EW detector

COMMON/EPHEM/ - Contains values found in the ephermeris file. The following values are taken every hour, 0-24, from the ephermeris file in subroutine F4PROC and are used in SCLABL.

RADIUS = radius in earth radii

LOCTIM = local time

MAGLAT = magnetic latitude

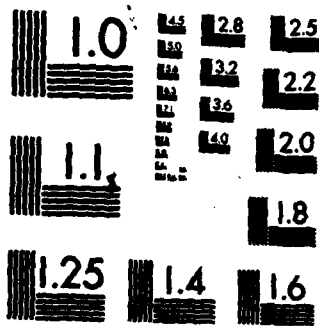
AD-A129 297

HANDBOOK FOR UCSD SC9 SCATHA AURORAL PARTICLES
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23



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

3.2 SC9 TAPE LISTING

The tape listing gives day, year, time, particle count rates, magnitude of the magnetic field vectors, detector position, computed distribution functions, detector pitch angles, detector energy and the energy step number. Figure (to be created) shows a typical output page. At the top of the listing is the year, day, start and end time of the listing and the day the listing was created. The Ground time in seconds, and in hours, minutes and seconds is outputted every 16 seconds. The variable SUBCOMID (TBD) is also given every 16 seconds. So far it has always been set equal to zero.

Count rates are given for the High Energy Detectors (NS and Fixed) and for the Low Energy Detector (EW). The accumulator assignments when in scan mode are:

ACC1 = NS Ions

ACC2 = NS Electrons

ACC3 = EW Ions

ACC4 = EW Electrons

ACC5 and ACC6 = Fixed Detector (two readings per 1/4 second)

Nominally, these accumulator assignments are the same during a dwell period. However, as each accumulator can be used to sample different directions and particles than normally assigned to them, there are eight different accumulator assignment modes available. Examples

of these modes are: Fast Ion, Super Fast Ion, etc... (see page 48 for the current SC-9 Handbook for a table of all modes and their commands)

The energies of the High Energy and Low Energy Detectors are given in eV. The High Energy values are not given until after the first dwell period of the listing. This is because the High Energy values must have the C1 energy correction, which is dependent upon M. As M is the number of steps since the last dwell, one dwell must occur before the C1 corrected High Energy values can be determined.

The distribution function in (sec**3) * (KM**-6) is given. As above, the values for the High Energy Detectors are not given until after the first dwell period.

LIST OF VARIABLES

IDC = Energy step number

MAGTOT = magnitude of the total magnetic field vector

MAGX = magnitude of the X component of the magnetic field

MAGY = magnitude of the Y component of the magnetic field

MAGZ = magnitude of the Z component of the magnetic field

HIPC = high energy head position counter

HIP = high energy head position (voltage)

LOPL = low energy head position counter

LOP = low energy head position (voltage)

PAHI = pitch angle high energy detector (NS Detector)

PALO = pitch angle low energy detector (EW Detector)

PAFXD = pitch angle fixed detector

NOTE: The pitch angle is defined as the angle between the particle velocity vector and the magnetic field direction. (see figure (to be created)) The particle velocity direction is 180 degrees to the look direction of the detector. A negative direction is given when the detector is looking to the earthward side of the magnetic field line.

M = number of energy steps since last dwell

3.3 SPECTROGRAM DESCRIPTION

Spectrograms give a grey scale representation of the detector count rates with lightness, or intensity, as a function of the count rate. The two axes used on the spectrogram are energy versus time. Presently, the magnitude of the total magnetic field vector is plotted along the top of each spectrogram. Any or all of the five detectors can be placed on the same spectrogram. The user also has the option of selecting the pitch angles for which he wants the data to be displayed. (include several spectrograms here as examples)

AXES LABELING

The energy axis on the sides of a spectrogram is a combination of linear and then logarithmic scales. For the High Energy detector, the scale is linear from 0-10 eV and logarithmic from 10 eV to 80 keV. The Low Energy detector scale is linear from 0-0.2 eV and logarithmic from 0.2-1700 eV. The time axis on the bottom is in universal time, and usually specifies hours and minutes.

INTENSITY

The intensity scale of the spectrograms runs from 0-31. (integer

values) The raw counts are converted to this scale through the use of a table of conversion values. To develop this table, the biased log of the raw count rate is computed for a specified value of bias and background subtraction. Biased log(cnt rate) =

$$999.9 * \log_{10} [(\text{DTCR} - \text{background}) + \text{Bias}]$$

Where DTCR = Deadtime corrected count rate. (Default value for dead-time is 3.5 E-6 sec. This value can be changed in ACCESS)

NOTE: If (DTCR - Background) is negative, the Biased log(cnt rate) is set equal to 900. (this value can be changed in ACCESS) Also, if the background subtraction is absent, it is taken to be zero. Because of the way the program Blog (it computes the biased log) handles a bit shift, the background must be an even number. If it is not, the spectrogram program makes it so.

This biased log, computed once for the ions and once for the electrons, is then used to set up the intensity conversion table. The conversion table is also dependent upon the specified contrast.

If the converted raw counts are too large for the intensity scale, the user can either have the scale cycle or saturate at maximum intensity. In the cycle mode, the intensity reaches maximum lightness, then recycles back to black to start over again.

Figures (3.3-1 and 3.3-2) are two plots which show how the curve of the Intensity versus the Biases log(cnt rate) varies as one changes

either the bias or the contrast (CF). Varying the bias causes the curve to shift its starting point, while varying the contrast changes the slope of the curve.

MAGNITUDE OF MAGNETIC FIELD PLOTS

The magnitude of the total magnetic field vector is plotted on a 0-100 gamma scale. If the magnitude exceeds 100 gamma, the scale cycles, becoming a 100-200 gamma scale. This continues as long as necessary in 100 gamma cycles.

SCATHA SPECTROGRAM GRAY SCALE CONTRAST VARIATIONS

BIAS = 100, BACKGROUND = 0

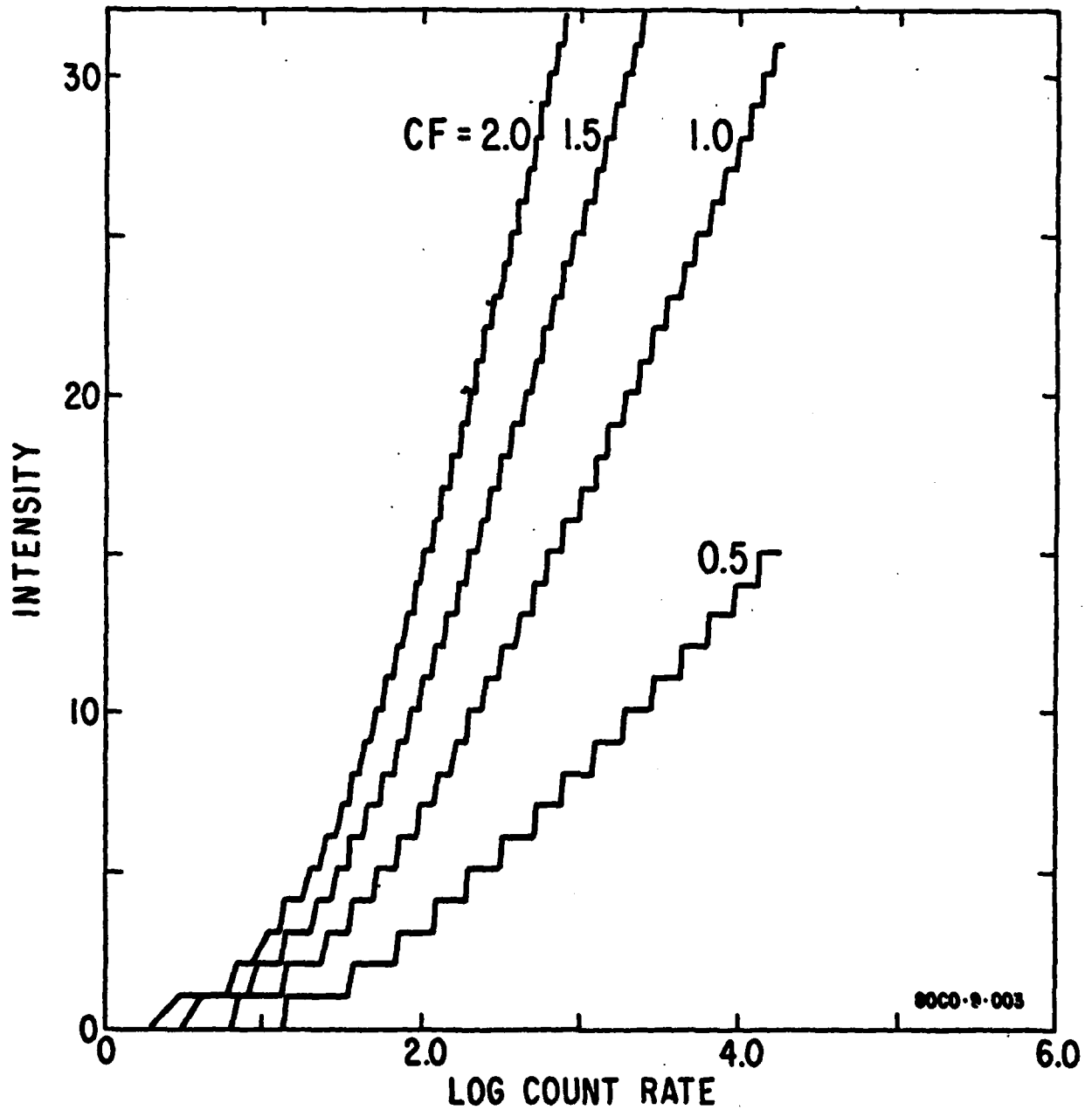
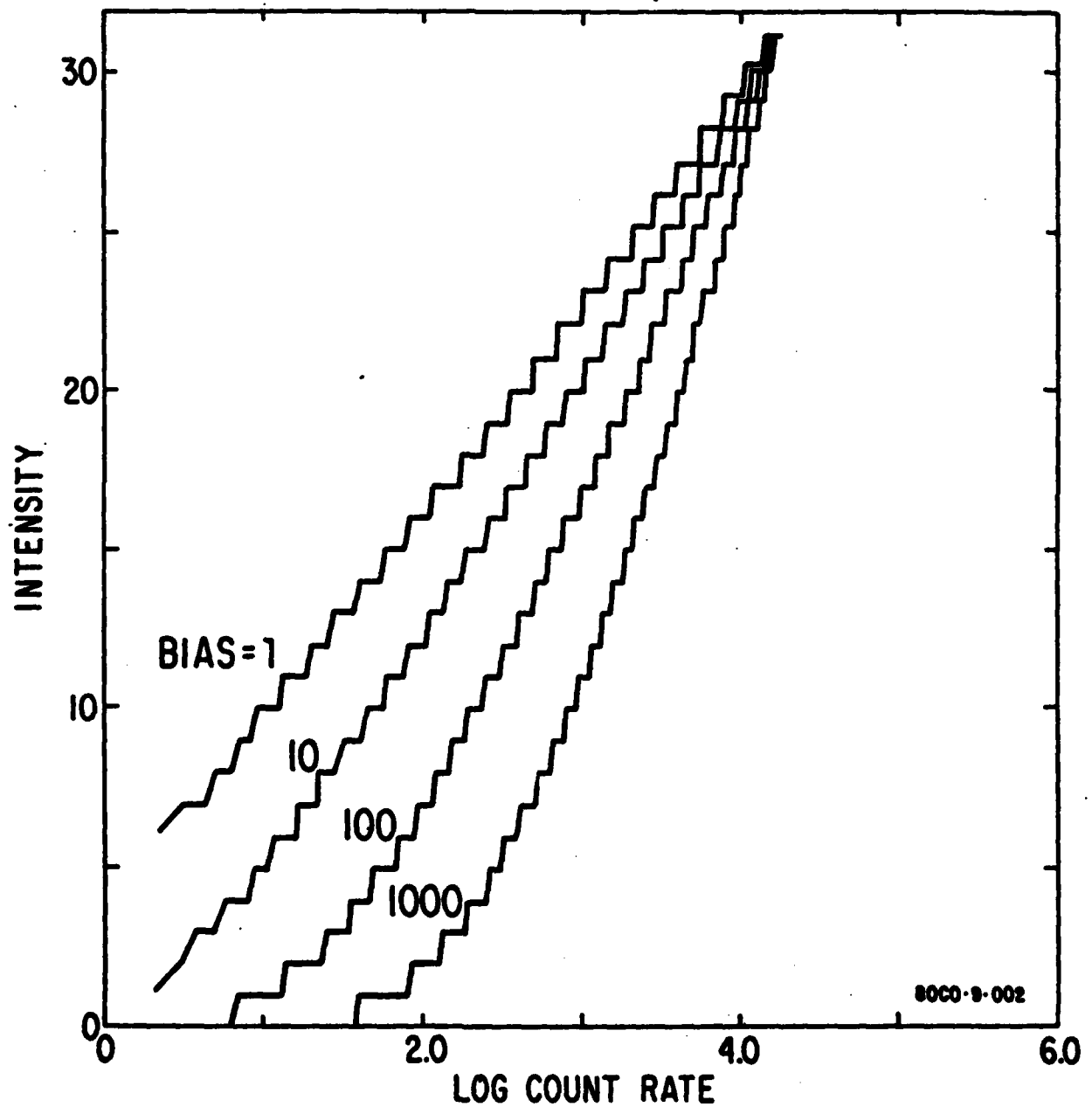


Figure 3.3-1

SCATHA SPECTROGRAM GRAY SCALE BIAS VARIATIONS

BACKGROUND = 0, CF = 1



80C0-9-002

Figure 3.3-2

APPENDIX 1

AFG1 ELECTRON AND ION GUN EXPERIMENT (SC4)

APPENDIX 1

SC4 DOCUMENTATION

AFGL ELECTRON AND ION GUN EXPERIMENT (SC4)

SC4 is the AFGL electron(-1) and ion(-2) gun experiment. Sufficient telemetry should be available to enable SC9 experimenters to determine the instrumental mode, and to understand the resulting potential fluctuations.

SC4-1

The electron gun operates in an uncomplicated fashion, simply ejecting electrons at the specified current and voltage. Substantial positive potential excursions have been caused, up to the beam potential. More frequently, the ambient low energy electron flux appears to be sufficient to balance the beam current at positive spacecraft potentials below the magnitude of the beam potential.

The common block containing this information is SC4E.

COMMON /SC4E/ CONTAINS ELECTRON GUN DATA FROM SC-4 EXPERIMENT
COMMON/SC4E/IRCF(5,8),IRON(2),IBDCF(2),IBEF1(2),IBEF2(2),IBEF(4,

1 IBCH(16),IHVM,IVM1,IVM2
BYTE IRCF,IRON,IBDCF,IBEF1,IBEF2,IBEF

C
C IRCF=BEAM CURRENT FLAGS 1-5 IRON=BEAM ON/OFF
C IBDCF=BEAM DUTY CYCLE FLAG IBEF1-2=BEAM FOCUS FLAGS 1-2
C IBEF=BEAM ENERGY FLAGS 1-4
C IBCH=BEAM CURRENT HI
C IHVM=HIGH VOLTAGE MONITOR
C IVM1-2=VOLTAGE MONITOR 1-2
C

The data are to be interpreted with the following tables:

Beam Current Flag (IRCF)

01111	13.0 ma
10111	6.0 ma
11011	1.0 ma
11101	0.1 ma
11110	0.01 ma
11111	0.001 ma

Beam Energy Flags

1100	3 kv
1100	3.00 kv
100	1.50 kv

A-1a

0000	0.50 kv
0010	0.30 kv
0001	0.15 kv
0011	0.05 kv

Beam On Off Flag

1	on
0	off

Duty Cycle Flag

1	100%
0	6.25% (inoperable after day 89, 1970)

Focus Flags

00	hi
10	medium
01	low
11	not allowed

Cap Flag

1	cap on
0	cap off (not valid)

Beam Current (IRCH)

IRCH should be multiplied by .02 to obtain the telemetry voltage in volts. Four volts is full scale. The scale changes with the selected voltage, so IRCH=200 implies the selected current (IPCF) is being emitted.

SC4-2

The ion gun is more complicated than the electron gun in operational modes and in data interpretation. In particular, the telemetry values are non-linear functions of the instrumental voltages and currents. Graphs for each value are included. In each case the earth Telemetry values (R T/M, V) on the graphs are .02 times the integer telemetry value found on the tape.

The ion gun parameters are found in common block SC4I. They are interpreted as follows:

```

C COMMON /SC4I/ CONTAINS ION GUN DATA FROM SC-4 EXPERIMENT
COMMON/SC4I/IPCM(16),NE(16),ISNCM(16),IDCUR(2),
1      IRVM,KCM,KHVM,IACM,IDCM,NHCM,NBVM,NBPF(2)
      BYTE NBPF
C
C      IRCM=BEAM CURRENT MONITOR
C      NE=NEUTRALIZER EMISSION          ISNCM=SPIBS NET CURRENT MONITOR
C      IDCUR=DISCHARGE CURRENT
C      IRVM=BEAM VOLTAGE MONITOR
C      KCM=KEEPER CURRENT MONITOR      KHVM=KEEPER HIGH VOLTAGE
C      IACM=ACCELERATOR CURRENT MTR    IDCM=DECELERATOR CURRENT MONITOR
C      NHCM=NEUT HTP CURRENT MONITOR  NBVM=NEUT BIAS VOLTAGE MONITOR

```

The beam voltage (IRVM) generally equals the set value, but the telemetry wanders as the beam current varies. The beam current telemetry (IRCM) is correct. The keeper current (KCM) may have an offset, and may vary as the beam setting is varied or with time.

Note that the neutralizer emission current (NE) and the net current (ISNCM) have a sign associated with them, and 2.5 volts (125 counts) corresponds to zero current.

APPENDIX 2

SC10 ELECTRIC FIELD MONITOR

APPENDIX 2

DESCRIPTION SC10

SC10 ELECTRIC FIELD MONITOR

The instrument is a NASA-supplied double floating ensemble consisting of three payload packages: SC10-1 is the internal electronics mechanism. SC10-2 is a 50-meter long, 1/4 inch in diameter, extendable antenna located on the Spacecraft at 236 degrees. It is often noted as the +Y Antenna. SC10-3 is also a 50-meter long extendable antenna and it is located at 56 degrees. It is often noted as the -Y Antenna.

The inner 30 meter section of the two booms are coated with Kapton insulation to move the outer 20 meter active probe areas away from the plasma sheath of the Spacecraft as this can overlap with the ambient plasma and contaminate probe measurements. When fully deployed, the two antennas will form a 100 meter (end to end) dipole. The instrument detects DC Electric Field strengths in the range of 0.1 to 20 mV/m and AC Fields of 1 to 100 micro V/m at frequencies between 3 and 10 Hz.

The probe on the end of each antenna will be used to measure AC and DC Electric Fields as a Common Mode Voltage and as a Differential Voltage. In the Common Mode, each antenna will be used separately to measure the Space Craft potential by measuring the absolute potential between the Space Craft and the ambient plasma. This signal will monitor Spacecraft charging events. For the Differential signal, the potential induced between the dipole pair of probes is measured in order to determine the Electric Fields in the ambient plasma.

The 100 meter dipole antenna is also shared by the SC1-7 and SC1-8 experiments. In addition, one of the Fourier digitized waveform analyzers can be ordered to detect the signal of the X component of the SC11 magnetometer experiment. (This data is received in the telemetry words K4012 - K4015. Word K2003 signifies which instrument is being monitored.) When operating in the Magnetic Field Mode, morphological data relative to the E and B noise at the orbit of the Spacecraft will be obtained. (From "Description of Space Test Program P78-2, Spacecraft and Payloads" page 53; "Telemetry Requirements Document, page 2.11-11; and the "Orbital Requirements Document, Volume 1)

OPERATIONAL ASPECTS

The extension of the two antennas was not begun until several weeks after the satellite's insertion into orbit. This was to allow the other experiments (which are sensitive to the Satellite's plasma sheath) a base line period without the interference created by the two long floating probes. The antennas were then deployed in three stages in order to study the probe characteristics of the antennas with varying degrees of overlap from the Spacecraft's plasma sheath. The boom

was extended to 10 meters on day 56, and was extended to its full length on day 68. (added 7-30-80 S.J.) The antennas have space brush material in the deployment motors to allow additional changes in the antennas' length once they have been fully deployed. However, the antennas will probably be kept at their full deployment of 100 meters for the lifetime of the satellite. (From "Description of Space Test Program P78-2, Spacecraft and Payloads", page 55)

SCIENTIFIC OBJECTIVES

The SC10 Electric Field Monitor will be used to observe the steady state convectional Electric Fields that are known to exist at the Spacecraft's orbit. The instrument will also measure Electric Fields resulting from transient events such as electrostatic discharge on selected Spacecraft insulating surfaces and to monitor Space Vehicle charging. Data from the instrument will be used to correlate data from the other engineering experiments on the satellite and, along with the SC1 Antennas, to characterize electromagnetic interference in the vicinity of the Spacecraft.

TELEMETRY SPECIFICATIONS

Data from SC10 is telemetered in three different formats: 1) Directly in digitized waveform; 2) in the Fourier Domain using digitized Fourier analyzed wave; 3) and in Real Time. (NOTE: UCSD receives only the Fourier digitized waveform) The SC10-3 Antenna (-Y Axis) is measured directly in the Common Mode using three different voltage ranges: -15 V, -300 V and -5,000 V. The SC10-2 Antenna (+Y Axis) is also measured directly in the Common Mode, but with only one voltage range of +15 V. (This favoring of the negative axis is due to the fact that the potential of the Spacecraft with respect to the probes is usually negative. This negative relative potential is caused by which the different materials the Spacecraft and probes are constructed of.)

The Differential signal between the two antennas is also monitored directly with several voltage gains which appear as DC Low ($\times 0.025$), DC High ($\times 0.25$), and AC ($\times 2.5$) in the telemetry data. Both the Common Mode signal and the Differential signal are monitored in the Fourier Domain as RMS signals in four frequency bands which vary from 0.1 to 2000 Hz.

For the Real Time mode, a wide band FM-FM Link is available on command only for the Differential signal. This format is planned for operations up to three hr/day in order to cover a number of different Local Time Regions. The following table describes the three different formats.

	COMMON MODE	DIFFERENTIAL MODE
FORMAT		
Direct	Ranges: a) +/- 15 V b) -300 V c) -5,000 V	Gains: a) X 0.025 b) X 0.25 c) X 2.5
Fourier	Freq. a) 0.1 to 1 Hz Bands: b) 1 to 2 Hz c) 2 to 20 Hz d) 20 to 2000 Hz	Freq. a) 0.1 to 1 Hz Bands: b) 1 to 2 Hz c) 2 to 20 Hz d) 20 to 200 Hz
Real Time	Not Telemetered	DC to 200 Hz V.C.O.

DESCRIPTION OF TELEMETRY WORDS

- K2001 - Calibration Verification of SC10-2 Antenna, Range: 0 - 5 Volts DC
- K2002 - Calibration Verification of SC10-3 Antenna, Range: 0 - 5 Volts DC
- K2003 - Magnetic/Common Mode Verification (signifies if the received output is from the SC10 Spectrometer or from the X Axis of the SC11 Magnetometer)
- K2004 - Mode
- K2005 - Full Extension of SC10-2 Antenna
- K2006 - Full Retraction of SC10-2 Antenna
- K2007 - Full Extension of SC10-3 Antenna
- K2008 - Full Retraction of SC10-3 Antenna

The following words must be converted to Volts DC using the equation: $\text{Volts} = 0.020 * (\text{measurement}) \text{ Volts DC}$
The Range of these words is 0 - 5.1 Volts DC.

- K4001 - DC High (For Direct Format of Differential signal)
- K4002 - DC Low (For Direct Format of Differential signal)
- K4003 - AC (For Direct Format of Differential signal)
- K4004 - Common Mode 1 (-) (For Direct Format of SC10-3 Antenna, DC Low)
- K4005 - common Mode 2 (-) (For Direct Format of SC10-3 Antenna, DC High)
- K4006 - Common Mode 3 (-) (For Direct Format of SC10-3 Antenna, AC)
- K4007 - Common Mode 1 (+) (For Direct Format of SC10-2 Antenna, DC Low)
- K4008 - Electric Channel 1, Frequency band from 0.1 to 1.0 Hz (For Fourier Format of Differential signal)
- K4009 - Electric Channel 2, Frequency band from 1 to 2 Hz (For Fourier Format of Differential signal)
- K4010 - Electric Channel 3, Frequency band from 2 to 20 Hz (For Fourier Format of Differential signal)
- K4011 - Electric Channel 4, Frequency band 20 to 200 Hz (For Fourier Format of Differential signal)

The next four words contain either the signal from the Fourier Format of the Common Mode or the output from the X Axis of the SC11 Magnetometer (in solar magnetospheric coordinates). See either the

constant "MV" or the word K2003 to determine which output is being monitored.

K4012 - Magnetic Channel 1 (Frequency Band from 0.1 to 1.0 Hz)

K4013 - Magnetic Channel 2 (Frequency Band from 1 to 2 Hz)

K4014 - Magnetic Channel 3 (Frequency Band from 2 to 20 Hz)

K2015 - Magnetic Channel 4 (Frequency Band from 20 to 200 Hz)

K4018 - Length Pot(-) (For determining the length of the extendable SC10-3Antenna)

K4019 - Length Pot(+) (For determining the length of the extendable SC10-2Antenna)

The following words are not to be converted to Volts DC.

K4016 - Motor temperature of SC10-2 Antenna

K4017 - Motor Temperature of SC10-3 Antenna

(K4016 and K4017 should be converted to degrees Centigrade by a TRD equation (equation 4.7.13-1))

K6001 - Broadband Electric Field (BEF) Sources

DEFINITION OF CONSTANTS

EX (Extension): EX will equal either "+E" or " ", depending upon whether word K2005 equals one or zero. EX will also equal either "-E" or " ", depending upon whether word K2007 equals one or zero.

RE (Retraction): RE will equal either "+R" or " ", depending upon whether word K2006 equals one or zero. RE will also equal either "-R" or " ", depending upon whether word K2008 equals one or zero.

DAT (Data(?)): DAT will equal either "+CL" "+SG", depending upon whether word K2001 equals one or zero. DAT will also equal either "-CL" or "-SG" depending upon whether word K2002 equals one or zero.

MV (Magnetic): MV will equal either "MG" (magnetic) or "CM", (Common Mode) depending upon whether word K2003 equals one or zero.

MODE: MODE equals either "ON" or "OFF", depending upon whether word K2004 equals one or zero.

SYST = System Time in integer seconds.

VTCW = Vehicle Time Code Word in integer seconds (from same Main Frame as DC High)

FRM = Frame Count from T8300 in same Main Frame as VTCW

SANG = Angle in degrees (0 - 360) between SC10-2 Antenna (+Y Axis) and

the plane defined by Space Vehicle spin axis and the sun Space Vehicle

line at time of sampling K4001. (The position of the +Y Antenna should be calculated to an accuracy of one degree with respect to the sun at time of measurement group reading)

APPENDIX 3

SC11 MAGNETIC FIELD MONITOR

DESCRIPTION

The SC11 Magnetic Field Monitor is a tri-axial fluxgate magnetometer with its sensors located on the end of a four meter long boom. The boom is along the spacecraft's negative Y axis (270 degrees) and the three sensor heads are accurately aligned with the corresponding spacecraft axes with one axis parallel to the satellite's spin axis. Each axis sensor consists of a high permeability core which is magnetized to saturation by a solenoid and an AC generator. The outputs of each sensor is biased by 2.5 volts to give each sensor the range of -700 gamma to +700 gamma in measuring the magnetic flux density.

An error analysis by the spacecraft's manufacturer estimates that the absolute accuracy of the measurements of the ambient field along the space vehicle's X axis will be better than one gamma at one sigma confidence level. Errors in the Y and Z axes will be even less than in the X axis. (From: Telemetry Requirements Document, page 67)

The instruments booms were deployed on 2-22-79. (day 53) The magnetometer was also checked out on this day. It began taking data on day 54.

The spacecraft's spin enables the small magnetic field (a few tenths of a nano tesla) due to the spacecraft and any stray remanent fields at the location of the magnetometer to be corrected for in the Y and Z axes. Calibration of the field in the X direction will hopefully be obtained from comparisons between the data obtained from SC11 and data from the UCSD Auroral Particles Experiment. (one nano tesla = one gamma = one milligauss)

SCIENTIFIC OBJECTIVES

The data from SC11 will be used to determine the magnitude and orientation of the magnetic field in the instrument's sensor coordinates. This information will be used to correlate results from all of the charged particle detectors with the earth's magnetic field and to analyze the field aligned and distributed current systems in the region around synchronous altitude. The information will also be used to study the magnetosphere dynamics as it effects spacecraft charging. (From: "Description of the Space Test Program P78-2 Spacecraft and Payloads" 31 October, 1978; section 18, page 56 and the Telemetry Requirements Document, (TRD), section 3.5)

MAGNETIC FIELD CALCULATIONS

The procedure for converting the analog outputs from the instrument's three sensors into the X,Y and Z components of the magnetic

field is as follows:

High resolution data from measurements L4001 thru L4006 and measurement L4010 will be used to compute the X,Y and Z components of the magnetic field in the magnetometer's coordinates using a least square fit for each 15 second segment of data as follows:

$$\begin{aligned} B_x &= A_x * [F(V_{xc}) + (V_{xf} - 0.473)/G_x - V_{ox}] + C_x + K_x(W) \\ B_y &= A_y * [F(V_{yc}) + (V_{yf} - 0.474)/G_y - V_{oy}] + C_y + K_y(W) \\ B_z &= A_z * [F(V_{zc}) + (V_{zf} - 0.477)/G_z - V_{oz}] + C_z + K_z(W) \end{aligned}$$

WHERE:

V_{xc} = L4001 converted to volts
 V_{yc} = L4003 converted to volts
 V_{zc} = L4005 converted to volts

V_{xf} = L4002 converted to volts
 V_{yf} = L4004 converted to volts
 V_{zf} = L4006 converted to volts
Volts= 0.020 * (Decimal representation of L40XX)

$F(V_{xc})$, $F(V_{yc})$ and $F(V_{zc})$ are found from the following table:

V_{xc}, V_{yc} or V_{zc}	$F(V_{xc})$	$F(V_{yc})$	$F(V_{zc})$
0.00 - 0.15	-0.0014	-0.0016	-0.0014
0.16 - 0.47	0.3111	0.3109	0.3111
0.48 - 0.78	0.6235	0.6235	0.6233
0.79 - 1.09	0.9362	0.9362	0.9360
1.10 - 1.41	1.2486	1.2483	1.2491
1.41 - 1.72	1.5613	1.5610	1.5618
1.73 - 2.03	1.8738	1.8737	1.8741
2.04 - 2.34	2.1865	2.1864	2.1869
2.35 - 2.65	2.5001	2.4995	2.4994
2.66 - 2.96	2.8128	2.8122	2.8121
2.97 - 3.28	3.1253	3.1250	3.1244
3.29 - 3.59	3.4380	3.4377	3.4372
3.60 - 3.90	3.7505	3.7498	3.7503
3.91 - 4.21	4.0632	4.0625	4.0631
4.22 - 4.52	4.3758	4.3754	4.3754
4.53 - 4.84	4.6886	4.6882	4.6882

(These are the revised values of $F(V_{xc})$, $F(V_{yc})$ and $F(V_{zc})$ as of 7-13-79 obtained through private correspondence with the experimenter.)

Ax= 192.58
Ay= 192.37
Az= 192.72

Kx(W), Ky(W) and Kz(W) are temperature correction factors using an interpolation table for each Kx, Ky or Kz. W is a thermister output and is the word L4010 converted to volts. For all values of W, Kx(W) and Kz(W) equal zero. The value of Ky(W) is to be found by linear interpolation between the following points:

W (Volts)	Ky(W) (Gamma)
0.0	0.0
3.7	0.0
4.8	0.8
5.1	1.02

(There is a discrepancy between the TRD and the Orbital Requirements Document (ORD) as to which functions equaled zero and which needed the interpolation table. According to the experimenter, the TRD is correct and Ky(W) needs the table.)

Gx= 12.991
Gy= 12.991
Gz= 12.991

Vox= 2.491
Voy= 2.513
voz= 2.499

Cx, Cy, and Cz are the correction for the spacecraft field for each axis and may require modification after more data has been obtained. The values given are those received from the experimenter as of 7-13-79. In the first three months, small fluctuations were seen by the experimenter in either the instrument zero or the spacecraft fields. The Y component has varied from -0.5 to +0.6 gamma, and probably cannot be corrected for general production runs. The Z component has ranged from -0.8 to -0.3 gamma, and Cz has been set at -0.5 gamma. The correction in the X field remains to be determined from comparisons between data obtained from the magnetometer and the UCSD Auroral Particles Experiment.

Cx= 0.0
Cy= 0.0

$$Cz = 0.5$$

These values of B_x, B_y and B_z shall be converted from sensor coordinates to the spinning space vehicle reference coordinates using:

$$B_s = R * B$$

where R is the appropriate transform matrix determined from SC11 boom alignment measurements.

$$[R] = \begin{bmatrix} .99980 & .01390 & .01304 \\ -.01307 & .99990 & .00209 \\ -.01307 & .00227 & .99991 \end{bmatrix}$$

(This matrix was received from the experimenter on 7-13-79)

The X, Y , and Z components of the magnetic field shall be converted from the spinning space vehicle coordinates into a non-spinning cartesian coordinate system (despun axis) using the following equation:

$$B_d = N * B_s$$

where N is the appropriate matrix described as follows:

$$[N] = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(\text{Alpha}) & \sin(\text{Alpha}) \\ 0 & -\sin(\text{Alpha}) & \cos(\text{Alpha}) \end{bmatrix}$$

where:

$$\text{Alpha} = w * 0.75 \text{ degrees}$$

w is the spin rate in rpm about the plus X axis.

This relationship is accurate for $3 \gg w \gg 0.5$.

Because the spacecraft is precessing about the Z axis, one also needs to obtain the direction of the angular momentum vector from SAM-TEC in order to compute the Despun Coordinate System more accurately. (The above algorithm for computing the various coordinate systems from the telemetry data was obtained from the TRD section 4.1 and from the ORD pages 4.7.14-1 thru 4.7.14-3.)

An alternate method of calculating the magnetic field is to use the low resolution data. This is primarily for contingency and cross-checking purposes. Measurements L4007 thru L4009 are used for this. Use the following equations to calculate the magnetic field in sensor coordinates:

$$B_{x1} = A_x * (V_{x1} - V_{ox}) + C_x + K_x(W)$$

$$B_{y1} = A_y * (V_{y1} - V_{oy}) + C_y + K_y(W)$$

$$B_{z1} = A_z * (V_{z1} - V_{oz}) + C_z + K_z(W)$$

Where the constants are the same as described for the high resolution equations. (From: TRD, section 4.2)

FLUXGATE MAGNETOMETER

The fluxgate action of the magnetometer is based on the time variation of the core permeability. The sensing element of a magnetometer is a core of permalloy or of a similar material which has a high permeability and so becomes magnetically saturated in very low magnetic fields. A periodically changing magnetic field is applied to the core by a solenoid and a generator which magnetises the core to saturation. As the core becomes saturated, the permeability of the material is reduced and so the permeability varies periodically as the core switches from one polarity of saturation to the other. As the permeability has its minimum value when the magnetising current has its peak negative and positive values, the permeability of the core will have twice the frequency of the magnetising current. The output signal contains a component of this second harmonic of the magnetising frequency and this component is proportional to the component of the ambient magnetic field along the axis of the secondary winding. (From "Fluxgate Magnetometers" by F. Prindahl, Plasma Group, Danish meteorological Institute, Technical University of Denmark; TRD, page 67; McGraw-Hill Encyclopedia of Science and Technology, 1971, volume 8)

APPENDIX 4

ECLIPSE TIMES

ECLIPSE TIMES

APPENDIX 4

1979 SPRING ECLIPSE

DATE	PEN. ENTRY	UMB. ENTRY	UMB. EXIT	PEN. EXIT
3-16-79	20:45:39			20:59:00
3-17-79	20:20:30	20:30:24	20:33:00	20:43:01
3-18-79	19:56:47	20:02:06	20:20:10	20:25:36
3-19-79	19:33:41	19:37:55	20:03:14	20:07:35
3-20-79	19:10:58	19:14:37	19:45:26	19:49:12
3-21-79	18:48:32	18:51:48	19:27:11	19:30:34
3-22-79	18:26:20	18:29:20	19:08:38	19:11:46
3-23-79	18:04:18	18:07:07	18:49:53	18:52:49
3-24-79	17:42:26	17:45:06	18:30:58	18:33:44
3-25-79	17:20:42	17:23:14	18:11:54	18:14:33
3-26-79	16:59:04	17:01:30	17:52:42	17:55:16
3-27-79	16:37:32	16:39:53	17:33:23	17:35:52
3-28-79	10:47:27	(PARTIAL LUNAR ECLIPSE)		12:28:22
3-28-79	16:16:04	16:18:22	17:13:58	17:16:22
3-29-79	15:54:41	15:56:55	16:54:26	16:56:48
3-30-79	15:33:23	15:35:34	16:34:51	16:37:09
3-31-79	15:12:10	15:14:19	16:15:10	16:17:27
4-01-79	14:51:02	14:53:10	15:55:26	15:57:41
4-02-79	14:30:00	14:32:06	15:35:40	15:37:53
4-03-79	14:09:04	14:11:09	15:15:50	15:18:02
4-04-79	13:48:14	13:50:18	14:55:57	14:58:08
4-05-79	13:27:29	13:29:32	14:36:02	14:38:13
4-06-79	13:06:50	13:08:53	14:16:03	14:18:14

4-07-79	12:46:16	12:48:19	13:56:02	13:58:13
4-08-79	12:25:47	12:27:51	13:35:58	13:38:09
4-09-79	12:05:24	12:07:28	13:15:49	13:18:01
4-10-79	11:45:05	11:47:10	12:55:37	12:57:50
4-11-79	11:24:51	11:26:58	12:35:21	12:37:35
4-12-79	11:04:42	11:06:50	12:14:60	12:17:15
4-13-79	10:44:38	10:46:48	11:54:34	11:56:51
4-14-79	10:24:39	10:26:51	11:34:03	11:36:22
4-15-79	10:04:46	10:07:01	11:13:26	11:15:48
4-16-79	09:45:00	09:47:18	10:52:45	10:55:10
4-17-79	09:25:21	09:27:42	10:31:58	10:34:26
4-18-79	09:05:50	09:08:15	10:11:05	10:13:38
4-19-79	08:46:27	08:48:58	09:50:06	09:52:44
4-20-79	08:27:14	08:29:50	09:29:00	09:31:44
4-21-79	08:08:11	08:10:54	09:07:47	09:10:38
4-22-79	07:49:18	07:52:10	08:46:23	08:49:24
4-23-79	07:30:36	07:33:40	08:24:48	08:27:60
4-24-79	07:12:06	07:15:24	08:02:58	08:06:23
4-25-79	06:53:52	06:57:28	07:40:48	07:44:33
4-26-79	06:35:55	06:39:58	07:18:13	07:22:24
4-27-79	06:18:23	06:23:07	06:54:59	06:59:51
4-28-79	06:01:26	06:07:27	06:30:36	06:36:44
4-29-79	05:45:29	05:56:38	06:01:23	06:12:40
4-30-79	05:32:04			05:46:06

1979 FALL ECLIPSE

9-20-79	07:40:37			08:00:60
9-21-79	07:15:39	07:22:27	07:38:30	07:45:10
9-22-79	06:51:60	06:56:56	07:23:13	07:28:01
9-23-79	06:29:00	06:33:07	07:06:13	07:10:12
9-24-79	06:06:26	06:10:04	06:48:26	06:51:56
9-25-79	05:44:12	05:47:29	06:30:11	06:33:20
9-26-79	05:22:12	05:25:14	06:11:35	06:14:29
9-27-79	05:00:23	05:03:13	05:52:42	05:55:25
9-28-79	04:38:43	04:41:24	05:33:36	05:36:09
9-29-79	04:17:11	04:19:45	05:14:17	05:16:43
9-30-79	03:55:46	03:58:13	04:54:47	04:57:07
10-01-79	03:34:25	03:36:48	04:35:07	04:37:22
10-02-79	03:13:10	03:15:28	04:15:18	04:17:29
10-03-79	02:52:00	02:54:14	03:55:21	03:57:28
10-04-79	02:30:55	02:33:06	03:35:17	03:37:21
10-05-79	02:09:56	02:12:04	03:15:08	03:17:09
10-06-79	01:49:02	01:51:08	02:54:53	02:56:52
10-07-79	01:28:13	01:30:17	02:34:34	02:36:31
10-08-79	01:07:28	01:09:30	02:14:11	02:16:06
10-09-79	00:46:47	00:48:48	01:53:42	01:55:36
10-10-79	00:26:09	00:28:09	01:33:08	01:35:01
10-11-79	00:05:34	00:07:33	01:12:29	01:14:21
10-12-79	23:45:01	23:46:59	00:51:44	00:53:36
10-13-79	23:24:30	23:26:28	00:30:54	00:32:45
10-14-79	23:04:01	23:05:59	00:09:57	00:11:48
10-15-79	22:43:34	22:45:32	23:48:56	23:50:47

10-16-79	22:23:09	22:25:08	23:27:49	23:29:40
10-17-79	22:02:47	22:04:46	23:06:37	23:08:29
10-18-79	21:42:28	21:44:28	22:45:20	22:47:13
10-19-79	21:22:12	21:24:13	22:23:59	22:25:53
10-20-79	21:01:59	21:04:02	22:02:34	22:04:30
10-21-79	20:41:50	20:43:54	21:41:04	21:43:02
10-22-79	20:21:45	20:23:51	21:19:30	21:21:30
10-23-79	20:01:44	20:03:52	20:57:52	20:59:55
10-24-79	19:41:48	19:43:59	20:36:10	20:30:15
10-25-79	19:21:55	19:24:11	20:14:21	20:16:30
10-26-79	19:02:07	19:04:27	19:52:26	19:54:40
10-27-79	18:42:24	18:44:50	19:30:24	19:32:44
10-28-79	18:22:46	18:25:18	10:08:13	19:10:40
10-29-79	18:03:13	18:05:54	18:45:53	18:48:28
10-30-79	17:43:47	17:46:39	18:23:21	18:26:07
10-31-79	17:24:29	17:27:37	18:00:35	18:03:36
11-01-79	17:05:23	17:08:52	17:37:31	17:40:54
11-02-79	16:46:32	16:50:34	17:14:00	17:17:57
11-03-79	16:28:04	16:33:10	16:49:39	16:54:39
11-04-79	16:10:15			16:30:45
11-05-79	15:53:37			16:05:21

1980 SPRING ECLIPSE

3-13-80	17:18:11			17:36:20
3-14-80	16:54:31	17:00:46	17:12:46	17:19:08
3-15-80	16:30:48	16:35:17	16:56:23	17:00:58
3-16-80	16:07:34	16:11:18	16:38:30	16:42:20
3-17-80	15:44:39	15:47:56	16:19:58	16:23:22
3-18-80	15:21:56	15:24:55	16:01:04	16:04:10
3-19-80	14:59:25	15:02:11	15:41:55	15:44:47
3-20-80	14:37:02	14:39:38	15:22:34	15:25:16
3-21-80	14:14:48	14:17:16	15:03:04	15:05:39
3-22-80	13:52:42	13:55:03	14:43:28	14:45:56
3-23-80	13:30:43	13:32:59	14:23:46	14:26:09
3-24-80	13:08:51	13:11:03	14:03:60	14:06:19
3-25-80	12:47:06	12:49:14	13:44:09	13:46:24
3-26-80	12:25:26	12:27:31	13:24:14	13:26:26
3-27-80	12:03:52	12:05:55	13:04:14	13:06:24
3-28-80	11:42:22	11:44:23	12:44:11	12:46:19
3-29-80	11:20:57	11:22:57	12:24:03	12:26:09
3-30-80	10:59:37	11:01:35	12:03:51	12:05:56
3-31-80	10:38:20	10:40:17	11:43:35	11:45:39
4-01-80	10:17:07	10:19:04	11:23:14	11:25:18
4-02-80	09:55:58	09:57:54	11:02:50	11:04:53
4-03-80	09:34:53	09:36:49	10:42:21	10:44:24
4-04-80	09:13:52	09:15:48	10:27:48	10:23:52
4-05-80	08:52:55	08:54:52	10:01:11	10:03:15
4-06-80	08:32:03	08:34:01	09:40:30	09:42:35
4-07-80	08:11:17	08:13:15	09:19:46	09:21:51

4-08-80	07:50:36	07:52:35	08:58:58	09:01:05
4-09-80	07:30:01	07:32:02	08:38:06	08:40:15
4-10-80	07:09:32	07:11:35	08:17:11	08:19:22
4-11-80	06:49:09	06:51:14	07:56:12	07:58:25
4-12-80	06:28:52	06:31:00	07:35:08	07:37:24
4-13-80	06:08:41	06:10:52	07:13:59	07:16:17
4-14-80	05:48:36	05:50:50	06:52:43	06:55:05
4-15-80	05:28:36	05:30:55	06:31:20	06:33:46
4-16-80	05:08:44	05:11:08	06:09:49	06:12:21
4-17-80	04:48:59	04:51:29	05:48:10	05:50:47
4-18-80	04:29:23	04:32:00	05:26:21	05:29:06
4-19-80	04:09:58	04:12:45	05:04:23	05:07:17
4-20-80	03:50:47	03:53:44	04:42:13	04:45:18
4-21-80	03:31:50	03:35:02	04:19:48	04:23:09
4-22-80	03:13:10	03:16:43	03:57:05	04:00:45
4-23-80	02:54:53	02:58:55	03:33:54	03:38:04
4-24-80	02:37:05	02:41:55	03:09:59	03:14:57
4-25-80	02:19:59	02:26:33	02:44:29	02:51:11
4-26-80	02:04:12			02:26:09

APPENDIX 5

MEASUREMENT LIST

APPENDIX 5 - MEASUREMENT LIST

P78-2 MEASUREMENT LIST HEADING DEFINITIONS

M A CHARACTER IN COLUMN ONE INDICATES THAT A MODIFICATION HAS BEEN MADE SINCE THE LAST PUBLICATION OF THE MEASUREMENT LIST. THE MODIFICATION STATUS BEGINS AT 1 FOR A P78-2 MEASUREMENT LIST IN THE ORD AND SEQUENTIALLY INCREASES FOR EACH P78-2 MEASUREMENT LIST PUBLISHED TILL THE P78-2 MEASUREMENT LIST IS ASSIGNED A NEW REVISION LETTER (BEGINNING WITH "A" AND CONTINUING ON THROUGH THE ALPHABET). NOTE: SEE THE LINE ABOVE THE SUBSYSTEM OR EXPERIMENT TITLE ON EACH PAGE FOR THE REVISION DATE AND LETTER. THE DATE AND REVISION OF THE PREVIOUS P78-2 MEASUREMENT LIST BEING INCORPORATED INTO THE NEW P78-2 MEASUREMENT LIST IS ALSO GIVEN.

ANY CHANGE TO A MEASUREMENT LINE, OTHER THAN THE ADDITION OR DELETION OF A BLANK SPACE, WILL CONSTITUTE A MODIFICATION.

S + A "+" IN COLUMN TWO INDICATES THE MEASUREMENT IS SUBCOMMUTATED. NOTE: A MEASUREMENT IS CONSIDERED SUBCOMMUTATED IF IT SHARES A VEHICLE/PAYLOAD INTERFACE WIRE WITH 1 OR MORE OTHER MEASUREMENTS. SEE SECTION 3.3 FOR A DESCRIPTION OF THE VARIOUS SUBCOMS. X AN "X" IN COLUMN TWO INDICATES THAT THE MEASUREMENT WAS DELETED AND/OR REPLACED BY ANOTHER MEASUREMENT.

(COLUMNS 3-7)

MEAS
NO

THE FIVE CHARACTER NUMBER ASSIGNED TO EACH MEASUREMENT: THE FIRST CHARACTER--AN ALPHA--DENOTES THE PARTICULAR SUBSYSTEM OR EXPERIMENT WHERE A MEASUREMENT ORIGINATES. ALPHA CHARACTERS ARE DESIGNATED AS FOLLOWS:

EXPT	EXPT	SUBSYSTEM
A SC1	G SC7	N SV AC&D
B SC2	H SC8	P SV PROPULSION
C SC3	J SC9	R SV THERMAL (TCS)
D SC4	K SC10	S SV STRUCTURES
E SC5	L SC11	T SV TT&C & TPM
F SC6	M ML12	V SV EPS

... THE MEASUREMENT LIST IS ARRANGED IN THE SAME ALPHABETIC ORDER ...

THE SECOND CHARACTER--ONE OF FOUR DIGITS--DESIGNATES THE TYPE OF MEASUREMENT SIGNAL AS FOLLOWS:

2	BILEVEL (DISCRETE)
4	ANALOG
6	BROADBAND
8	DIGITAL

SEE NOTE ON PAGE 6.1-05 CONCERNING MEASUREMENT TYPE. THE LAST THREE CHARACTERS ARE SEQUENTIAL NUMBERS TO PROVIDE A UNIQUE MEASUREMENT NUMBER FOR EACH MEASUREMENT FROM A GIVEN SUBSYSTEM OR EXPERIMENT.

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(28-FEB -78 REV C)

PAGE 6.1-02

P70-2 MEASUREMENT LIST HEADING DEFINITIONS

MEASUREMENT
NAME/MNEMONIC (COLUMNS 9-49)
THE MEASUREMENT DEFINITION OR DESCRIPTION AND A
MNEMONIC ABBREVIATION--7 CHARACTERS OR LESS--OF THE MEASUREMENT
NAME (MNEMONICS WILL NOT PURPOSELY APPEAR IN THE ACRONYMS
AND ABBREVIATIONS LIST)
RANGE (COLUMNS 51-66)
MIN MAX

THE NOTATION "CAL TABLE" BELOW THE MIN/MAX VALUES INDICATES THAT
A CALIBRATION TABLE FOR THIS MEASUREMENT IS PROVIDED IN SEC 8.1.1
FOR BILEVELS- THE FALSE (0) AND TRUE (1) NOMINAL VOLTAGE LEVELS
FOR DIGITALS- THE TOTAL NUMBER OF BITS IN THE MEASUREMENT OR THE
RANGE OF VALUES REPRESENTED BY THE N-BIT MEASUREMENT.
FOR ANALOGS- THE EXTENT OF THE SENSOR CALIBRATION, THE ANALOG TO
DIGITAL OUTPUT, OR THE TRANSDUCER OUTPUT. ONLY ONE OF THESE RANGES
IS GIVEN AND IS REFERRED TO AS THE "TRANSDUCER RANGE".
***** SEE SECTION 4.7.1 FOR DISPLAY CONVERSION REQUIREMENTS *****

THE SMALLEST SUBSET OF THE TRANSDUCER RANGE THAT STILL CONTAINS
THE SUCCESSFUL OR NORMAL OPERATING LIMITS IS REFERRED TO AS THE "OPER-
ATING RANGE" AND IS GIVEN IN THE "NOTES" COLUMN. IN CASES WHERE THE
OPERATING RANGE IS THE SAME AS THE TRANSDUCER RANGE, ONLY THE TRANSDU-
CER RANGE IS GIVEN.
THE SUBSET OF THE TRANSDUCER RANGE THAT CORRESPONDS TO THE SENSOR
OR MONITORED INSTRUMENT BEING IN AN OFF CONDITION IS REFERRED TO AS THE
"OFF RANGE". THE OFF RANGE IS ONLY LISTED IN THE "NOTES" COLUMN IF IT
LIES OUTSIDE OF THE OPERATING RANGE.
THE DIFFERENCE BETWEEN THE TRANSDUCER RANGE AND THE OPERATING RANGE
IS REFERRED TO AS THE "FAILURE RANGE". THE FAILURE RANGE IS ONLY GIVEN
WHEN IT COINCIDES WITH THE OFF RANGE. (THE OFF RANGE BECOMES A FAIL-
URE RANGE WHEN THE DEVICE IS SWITCHED FROM AN OFF CONDITION TO AN ON
CONDITION.)

IN SOME CASES, THE RANGE DATA IS TBD AND THE RANGE AND UNITS ARE GIVEN
AS "0 TO NMAX DECI" WHERE NMAX IS THE MAXIMUM VALUE REPRESENTED BY AN
N-BIT WORD; OR THE RANGE IS GIVEN AS "N TO N BITS". THESE WILL BE UP-
DATED AS CALIBRATION DATA BECOMES AVAILABLE FROM TEST.

UNIT (COLUMNS 67-70)
THE UNITS THE RANGE IS MEASURED IN. SEE BELOW FOR ACRONYMS AND
ABBREVIATIONS USED.

RATE (COLUMNS 72-77)
SPS THE MEASUREMENT SAMPLE RATE GIVEN IN SAMPLES PER SECOND

P78-2 MEASUREMENT LIST HEADING DEFINITIONS

LOCATION (COLUMNS 78-88)

WD1-FR1-BIT

WORD NUMBER-MAIN FRAME START NUMBER-START & END BIT NUMBER
THESE NUMBERS DEFINE THE LOCATION OF THE MEASUREMENT IN THE PCM EN-
CODER FORMATS. SECTION 3.3 DESCRIBES THE WORD-FRAME-BIT NUMBERING
SYSTEM USED FOR P78-2. THERE ARE TWO MEASUREMENT LISTS GIVEN BELOW -
ONE FOR THE 8192 BPS TRANSFER ORBIT AND FINAL ORBIT FORMATS AND ONE
FOR THE 512 BPS AUXILIARY PCM FORMAT. THESE ARE IDENTIFIED IN THE
FIRST LINE OF EACH PAGE HEADING IN COLUMNS 75-82 AS 8192 BPS OR
512 BPS.

IF THE MEASUREMENT SPANS A WORD BOUNDARY (INDICATED BY A '+' IN
COLUMN 89), THE LOCATION SPECIFICATION IS CONTINUED IN COLUMNS 90-100
FOR AS MANY LINES AS NECESSARY.

IF THE MEASUREMENT IS SAMPLED MORE THAN ONCE PER MAIN FRAME OR
IS NOT IN THE SAME WORD IN OTHER MAIN FRAMES (+ IN 89), THE LOCATION
SPECIFICATION IS GIVEN IN COLUMNS 78-88 FOR AS MANY LINES AS REQUIRED

OTHER INFORMATION ON THE MEASUREMENT LOCATION IS GIVEN IN THE
NOTES COLUMN AS NECESSARY. THE MAIN FRAME NUMBERS CAN BE CALCULATED
FROM THE SAMPLE RATE AND MAIN FRAME START NUMBER AS SHOWN BELOW.

8192 BPS	512 BPS
8 BITS PER WORD	8 BITS PER WORD
1024 WORDS/SEC	64 WORDS/SEC
128 WORDS/MAIN FRAME	64 WORDS/MAIN FRAME
8 MAIN FRAMES/SEC	1 MAIN FRAME/SEC
128 MAIN FRAMES/MASTER FRAME	4 MAIN FRAMES/MASTER FRAME
1 MASTER FRAME/16 SEC	1 MASTER FRAME/4 SEC

.. 8192 BPS FORMATS ..

SAMPLES PER SECOND	SAMPLES PER MAIN FRAME	SAMPLES PER MASTER FRAME	MAIN FRAME NUMBERS
1/16	1/128	1	MF=FR1
1/8	1/64	2	MF=64*N+FR1, N=0,1
1/4	1/32	4	MF=32*N+FR1, N=0,3
3/8	3/64	6	
1/2	1/16	8	MF=16*N+FR1, N=0,7
1	1/8	16	MF=8*N+FR1, N=0,15
2	1/4	32	MF=4*N+FR1, N=0,31
3	3/8	48	
4	1/2	64	MF=2*N+FR1, N=0,63
5	5/8	80	
8	1	128	MF=N, N=0,127
16	2	256	
32	4	512	
48	6	768	

P70-2 MEASUREMENT LIST HEADING DEFINITIONS

STATUS OR
W02-FR2-B17

(COLUMNS 90-100)

FOR BILEVELS ONLY - THE ON-WIRE STATUS OF A 0 SIGNAL AND A 1
SIGNAL. E.G. 0-XXXX 1-YYYY.

FOR ANALOGS AND DIGITALS - THE CONTINUATION OF THE MEASUREMENT
LOCATION AS DESCRIBED ABOVE.

NOTES

(COLUMNS 102-132)

THESE COLUMNS ARE FOR THE PRESENTATION OF CHARACTERISTICS NOT
SHARED BY ALL MEASUREMENTS AND FOR THE INCLUSION OF DATA THAT
CANNOT BE LISTED IN THE APPROPRIATE COLUMN DUE TO LENGTH.
SOME TYPICAL NOTES OF IMPORTANCE ARE -

BILEVEL A2XXX - THE BILEVEL CORRESPONDING TO THE MEASUREMENT
STATED

SEE ORD TABLE N.K-M - REFERENCES LOCATION IN THE ORD OF INFORMA-
TION CONCERNING THE TELEMETRY BIT PATTERNS OR ANOMALIES IN THE
COMMUTATION OF THE MEASUREMENT E.G., MEASUREMENTS NOT SYNCHRON-
IZED WITHIN THE PCM ENCODER.

INFORMATION REGARDING SUBSETS OF RANGES

IN SOME CASES, SERIAL DIGITAL MEASUREMENTS HAVE BEEN ASSIGNED
ANALOG OR BILEVEL MEASUREMENT NUMBERS TO ACCOMMODATE GROUND TEST
SOFTWARE LIMITATIONS. SUCH MEASUREMENTS ARE NOTED BY GIVING THE
SERIAL DIGITAL CHANNEL NUMBER IN THE NOTES COLUMN (EG, SD13).
ALSO, SOME BILEVELS HAVE BEEN COMBINED AND ASSIGNED DIGITAL
MEASUREMENT NUMBERS. THE TRUE CHANNEL TYPES ARE LISTED IN
TABLES 3.3-1, 3.3-2, AND 3.3-19.

ACRONYMS AND ABBREVIATIONS USED
IN THE MEASUREMENT LIST

A/B	AIR-BORNE
AC&D	ATTITUDE CONTROL AND DETERMINATION
ACT	ACTIVATE
AGC	AUTOMATIC GAIN CONTROL
AIM	APOGEE INSERTION MOTOR
AMPLTD	AMPLITUDE
ATCH	ATTACHED
A-TO-D	ANALOG TO DIGITAL CONVERTER
AUTO	AUTOMATIC
AUX	AUXILIARY
BATT	BATTERY
BB	BROADBAND
BOT	BEGINNING OF TAPE
BPS	BITS PER SECOND
BSBND	BASEBAND
BT	BOTTOM
CAL	CALIBRATION
CAT	CATALYST
CDU	COMMAND DISTRIBUTION UNIT
CEA	CONTROL ELECTRONICS ASSEMBLY
CLSD	CLOSED
CM	COMMON MODE
CMD	COMMAND
CNTRL	CONTROL
COIN	COINCIDENCE
COINC.	COINCIDENCE
CPS	COUNTS PER SECOND
CRM	COUNT RATE MONITOR
CTS	COUNTS
CUR.	CURRENT
DACT	DEACTIVATE
DB	DECIBELS
DECI	DECIMAL
DEG	DEGREES
DEGC	DEGREES CELSIUS
DEGF	DEGREES FAHRENHEIT
DEMOD	DEMODULATOR
DNRG	DE-ENERGIZE
DSABL	DISABLE
DSAS	DIGITAL SUN ANGLE SENSOR
DSBL	DISABLE
DUM	DUMMAY
DWLL	DWELL
E	ELECTRON (E IS JUST A LABEL IN THE SCS EXPERIMENT)
ELEC	ELECTRIC
ENABL	ENABLE
ENBL	ENABLE
ENCO	ENCODER
ENG	ENGINE
EOT	END OF TAPE
EPS	ELECTRICAL POWER SUBSYSTEM
ERR	ERROR
ESA	ELECTROSTATIC ANALYZER

ACRONYMS (CONTINUED)

EW	EAST/WEST (AN SC9 DETECTOR)
EXEC	EXECUTE
EXT.	EXTERNAL
FD	FIXED (AN SC9 DETECTOR)
FEXT	FULLY EXTENDED
FFD	FAST FORWARD
FINL	FINAL
FLO	FOLDED
FOV	FIELD OF VIEW
FT	FEET
FTRC	FULLY RETRACTED
GND	GROUND
GAMMA	GAMMAS (MAGNETIC FIELD UNIT)
HTR	HEATER
H.V.	HIGH VOLTAGE
HYDR	HYDRAZINE
HZ	HERTZ
I.D.	IDENTIFICATION
IMOT	IN MOTION
INC	INCORPORATES
INH8	INHIBIT
INPT	INPUT
INT	INTERNAL
INTGRL	INTEGRAL
K	KILO
KCTS	KILO-COUNTS
KV	KILO-VOLTS
LSB	LEAST SIGNIFICANT BIT
LSV	LATCHING SOLENOID VALVE
MA	MILLI-AMPS
MAG	MAGNETOMETER
MAGN	MAGNETIC
MF(S)	MAIN FRAME(S)
MHZ	MEGA-HERTZ
MIDPT	MIDPOINT
ML12	MATERIALS EXPERIMENT 12
MLTIPLXR	MULTIPLER
MODE0	IN MODE 0
MSB	MOST SIGNIFICANT BIT
NAMP	NI-CAMPERE
NBOT	NOT BEGINNING OF TAPE
NOTA	NO DATA
NEG.	NEGATIVE
NEOT	NOT END OF TAPE
NEUT	NEUTRALIZER
NEXT	NOT FULLY EXTENDED
NFFD	NOT FAST FORWARD
NMDO	NOT IN MODE 0
NMOT	NOT IN MOTION
NO.	NUMBER
NRCD	NOT RECORDING
NRG	ENERGIZE
NRPR	NOT REPRODUCING

PL5863011

(28-FEB -78 REV C)

PAGE 6.1-07

ACRONYMS (CONTINUED)

NS	NORTH/SOUTH (AN SC9 DETECTOR)
NSEL	NOT SELECTED
NSYN	NOT SYNCHRONIZED
NTRC	NOT FULLY RETRACTED
OCTL	OCTAL
OFU	ORCHANCE FIRING UNIT
OW	OPEN
OPLIM	NOMINAL OPERATING LIMITS
OP/O	OPERATE/OFF
OPORB	OPERATIONAL ORBIT
OPRT	OPERATE
ORD	ORBITAL REQUIREMENTS DOCUMENT
P	PROTON
PARA.	PAPALLEL
PCM	PULSE CODE MODULATION
PCU	POWER CONTROL UNIT
PDNG	PRIMARY DE-ENERGIZE
PENG	PRIMARY ENERGIZE
PERP.	PERPENDICULAR
PHA	PULSE-HEIGHT-ANALYZER
POS	POSITION
POSI.	POSITIVE
PPA	POWER PROCESSOR ASSEMBLY
PRIM	PRIMARY
PROC.	PROCESSING
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSK	PHASE SHIFT KEY
PWR	POWER
RC	RECEIVER
RCD	RECORDING
RCVR	RECEIVER
REF	REFERENCE
REM	ROCKET ENGINE MODULE
RF	RADIO FREQUENCY
RJCT	REJECT
RLSD	RELEASED
RPA	RETARDING POTENTIAL ANALYZER
RPM	REVOLUTIONS PER MINUTE
RPR	REPRODUCING
RSET	RESET
S-N/#	SWITCH NUMBER ---/POSITION NUMBER ---
SCN	SCIENTIFIC EXPERIMENT NUMBER ---
SCND	SECONDARY
SONG	SECONDARY DE-ENERGIZE
SEC(S)	SECOND(S)
SEL	SELECTED
SELC	SELECT
SENG	SECONDARY ENERGIZE
SEP.	SEPARATED
SHCI	STEERABLE HORIZON CROSSING INDICATOR
SIG	SIGNAL

ACRONYMS (CONTINUED)

SHGL	SINGLE
SPIBS	SATELLITE POSITIVE ION BEAM SYSTEM
S/R	STANDBY/REJECT
SSD	SOLID STATE DETECTOR
SSS	SOLID STATE SPECTROMETER
STBY	STANDBY
SV	SPACE VEHICLE
SWCH	SWITCH
S/X	STANDBY/EXECUTE
TBD & ???	TO BE DETERMINED (IDENTIFIES A LACK OF INFORMATION)
TCS	THERMAL CONTROL SYSTEM
TOU	TIMING DISTRIBUTION UNIT
TEMP.	TEMPERATURE
TN	TELEMETRY
TMLCK	TELEMETRY LOCKED
TORB	TRANSFER ORBIT
TP	TOP
TPM	TRANSIENT PULSE MONITOR
TR	TAPE RECORDER
TRM	TERMINATED
TT&C	TELEMETRY, TRACKING AND COMMAND
V	VOLTS
VAC	VOLTS ALTERNATING CURRENT
VDA	VALVE DRIVE AMPLIFIER
VDC	VOLTS DIRECT CURRENT
VOLT.	VOLTAGE
VP	VOLTAGE POTENTIAL
VTCW	VEHICLE TIME CODE WORD
WD(S)	WORD(S)
XFER	TRANSFER
XN	TRANSMITTER
XMYR	TRANSMITTER
(+)	POSITIVE
(-)	NEGATIVE

Figure A.5-1

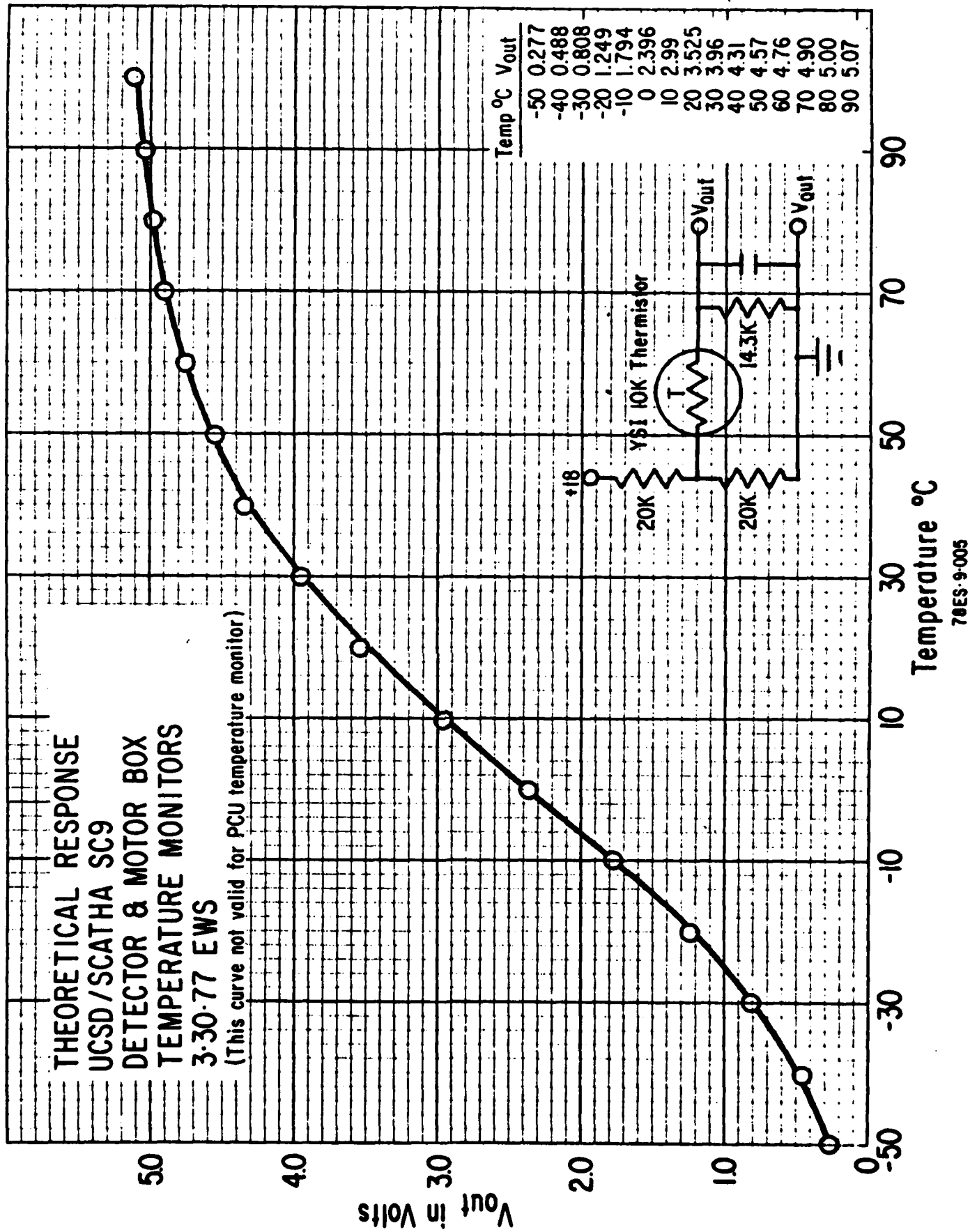
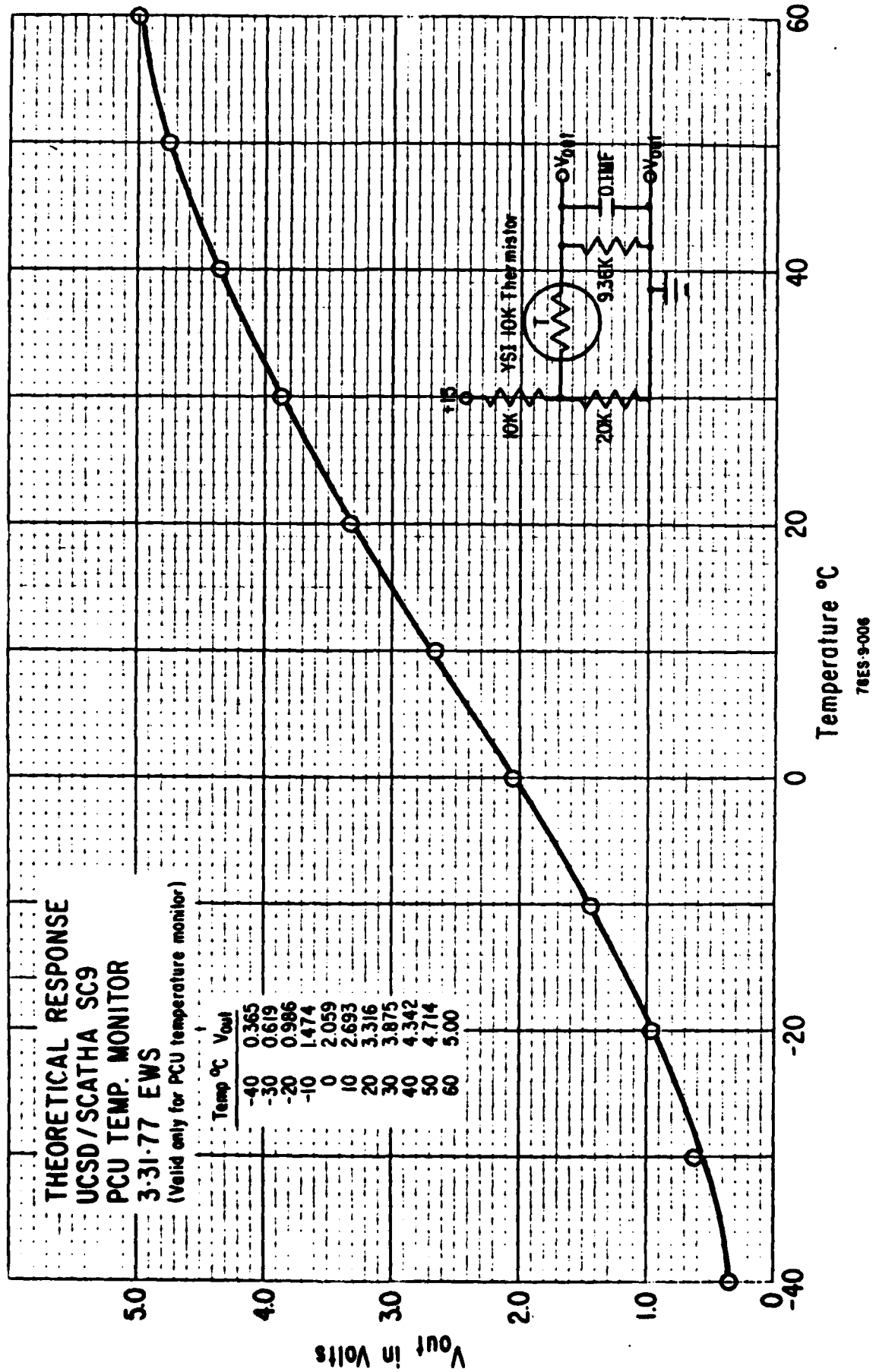


Figure A.5-2



P78-2 MEAS MS NO	SC9 EXPERIMENT MEASUREMENT NAME/ALPHANUMERIC	(28-FEB -78 REV C) SUPERSEDES (20-JAN -78 REV B)	RANGE		UNIT	8192 BPS RATE LOCATION SPS WD1-FR1-BIT WD2-FR2-BIT	STATUS OR	SC9 EXPERIMENT NOTES	PAGE 1
			MIN	MAX					
J4001 (+)	DEFLECTION VOLTAGE NORTH/SOUTH +DVNS		0 TO 5.1		VDC	1/016 102-107-1/8		0=OFF/FAIL; 1/5.1=OPRT	
J4002 (-)	DEFLECTION VOLTAGE NORTH/SOUTH -DVNS		0 TO 5.1		VDC	1/016 102-108-1/8		0=OFF/FAIL; 1/5.1=OPRT	
J4003 (+)	DEFLECTION VOLTAGE EAST/WEST +DVEW		0 TO 5.1		VDC	1/016 102-109-1/8		0=OFF/FAIL; 1/5.1=OPRT	
J4004 (-)	DEFLECTION VOLTAGE EAST/WEST -DVEW		0 TO 5.1		VDC	1/016 102-110-1/8		0=OFF/FAIL; 1/5.1=OPRT	
J4005 (+)	DEFLECTION VOLTAGE FIXED +DVFO		0 TO 5.1		VDC	1/016 102-111-1/8		0=OFF/FAIL; 1/5.1=OPRT	
J4006 (-)	DEFLECTION VOLTAGE FIXED -DVFO		0 TO 5.1		VDC	1/016 102-112-1/8		0=OFF/FAIL; 1/5.1=OPRT	
J4007	SPIRALTRON VOLTAGE NORTH/SOUTH SVNS		0 TO 5.1		VDC	1/016 102-113-1/8		0=OFF/FAIL; 1/2=OPRT	
J4008	SPIRALTRON VOLTAGE EAST/WEST SVEW		0 TO 5.1		VDC	1/016 102-114-1/8		0=OFF/FAIL; 1/2=OPRT	
J4009	SPIRALTRON VOLTAGE FIXED SVFO		0 TO 5.1		VDC	1/016 102-115-1/8		0=OFF/FAIL; 1/2=OPRT	
6 J4010	NORTH/SOUTH TEMPERATURE TNS		-50 TO 80 CAL TABLE		DEGC	1/016 102-116-1/8		-40/+50=OPRT; TEST RANGE IS -40/+70	
6 J4011	EAST/WEST TEMPERATURE TEW		-50 TO 80 CAL TABLE		DEGC	1/016 102-117-1/8		-40/+50=OPRT; TEST RANGE IS -40/+70	
6 J4012	MOTOR BOX TEMPERATURE TMB		-50 TO 80 CAL TABLE		DEGC	1/016 102-118-1/8		-40/+50=OPRT; TEST RANGE IS -40/+70	
6 J4013	PCU TEMPERATURE TPCU		-40 TO 60 CAL TABLE		DEGC	1/016 102-119-1/8		-40/+50=OPRT	
4 J4014	NS POSITION MONITOR (WORD 102) NSPOSS		0 TO 5.1		VDC	1/016 102-120-1/8			
4 J4015	EW POSITION MONITOR (WORD 102) EWPOSS		0 TO 5.1		VDC	1/016 102-121-1/8			
J4016	PCU MONITOR PCUMON		0 TO 5.1		VDC	1/016 102-122-1/8		0=OFF/FAIL; 1.0+-0.1=OPRT	
4 J4017	NS POSITION MONITOR (WORD 110) NSPOSF		0 TO 5.1		VDC	1/001 110-004-1/8			

A-30

P78-2	SC9 EXPERIMENT	(28-FEB -78 REV C)	RANGE	UNIT	SPS	LOCATION	STATUS OR	SC9 EXPERIMENT	PAGE 2
MEAS	MEASUREMENT	SUPERSEDES	MIN	MAX	SPS	WDI-FRI-BIT	WD2-FR2-BIT	NOTES	
MS NO	NAME/MNEMONIC	(20-JAN -78 REV B)							
4	J4018 EV POSITION MONITOR (WORD 110)		0 TO 5.1	VDC	1/001	110-005-1/8			
	EWPOSF								
	+J4501 ACCUMULATOR 1 (NS PROTONS)		0 TO 65535	DECI	4/001	104-001-1/8	105-001-1/8	MF-2-N+1, N=0, 63	SD15
	PNS								
	+J4502 ACCUMULATOR 3 (EW PROTONS)		0 TO 65535	DECI	4/001	049-001-1/8	050-001-1/8	MF-2-N+1, N=0, 63	SD9
	PEW								
	+J4503 ACCUMULATOR 5 (FD PROTONS)		0 TO 65535	DECI	4/001	051-001-1/8	052-001-1/8	MF-2-N+1, N=0, 63	SD10
	PFXO								
	+J2504 SCAN		0 OR 10	VDC	4/001	106-000-2	0-DWLL 1-SCAN	MF-3-N, N=0, 63	SD16
	SCAN								
	4+J8505 DEFLECTION CONTROL COUNTER		0 TO 63	DECI	4/001	106-000-3/8		MF-2-N, N=0, 63	LC124-018
	DCC								
	4+J8506 NORTH/SOUTH POSITION COUNTER		0 TO 2047	DECI	1/001	106-001-1/8	106-005-6/8	MF-8-N+1, N=0, 15	LC124-018
	NSPC								
	4+J8507 EAST/WEST POSITION COUNTER		0 TO 2047	DECI	1/001	106-003-1/8	106-005-2/4	MF-8-N+3, N=0, 15	LC124-018
	EWPC								
	+J2508 COUNTER-CLOCKWISE EAST/WEST		0 OR 10	VDC	1/001	106-005-1	0-TBD 1-TBD		SD18
	CCNEW								
	+J2509 COUNTER-CLOCKWISE NORTH/SOUTH		0 OR 10	VDC	1/001	106-005-5	0-TBD 1-TBD		SD16
	CCWNS								
	4+J8510 NORTH/SOUTH LOWER LIMIT		0 TO 255	DECI	1/016	106-007-1/8			LC124-018
	NSLL								
	4+J8511 NORTH/SOUTH UPPER LIMIT		0 TO 255	DECI	1/016	106-015-1/8			LC124-018
	NSUL								
	4+J8512 EAST/WEST LOWER LIMIT		0 TO 255	DECI	1/016	106-023-1/8			LC124-018
	EWLL								
	4+J8513 EAST/WEST UPPER LIMIT		0 TO 255	DECI	1/016	106-031-1/8			LC124-018
	EWUL								
	4+J8532 DWELL TIME		0 TO 255	DECI	1/016	106-055-1/8			LC124-018
	DT								
	4+J8533 DWELLS/CYCLE		0 TO 255	DECI	1/016	106-063-1/8			LC124-018
	DN								
	4+J8534 INITIAL DWELL STEP		0 TO 255	DECI	1/016	106-071-1/8			LC124-018
	ID1								

A-31

PL5863011

(28-Feb-78 Rev C)

Page 6.1-051

P78-2	SC9 EXPERIMENT	(28-FEB -78 REV C)	RANGE	UNIT	8192 BPS	STATUS OR	SC9 EXPERIMENT	PAGE 3
MEAS	MEASUREMENT	SUPERSEDES	MIN	MAX	RATE	LOCATION	NOTES	
MS NO	NAME/MNEMONIC	(20-JAN -78 REV B)			SPS	WD1-FR1-BIT	WD2-FR2-BIT	
4+J8535	DWELL STEP SIZE		0 TO 255	DECI	1/016	106-079-1/8		LC124-018
4+J8538	ACCUMULATOR GATING		0 TO 255	DECI	1/016	106-087-1/8		LC124-018
4+J8539	MOTOR POWER		0 TO 255	DECI	1/016	106-095-1/8		LC124-018
4+J8545	LATCHING COMMANDS 1 THRU 7 STATUS		0 TO 255	DECI	1/016	106-103-1/8		LC124-018
4+J8552	LATCHING COMMANDS 8 THRU 14 STATUS		0 TO 255	DECI	1/016	106-111-1/8		LC124-018
4+J8559	COMMAND BUS		0 TO 255	DECI	1/016	106-119-1/8		LC124-018
4+J8560	MAGNITUDE COMMAND HIGH		0 TO 255	DECI	1/016	106-127-1/8		LC124-018
4+J8566	ACCUMULATOR 2 (NS ELECTRONS)		0 TO 65535	DECI	4/001	104-000-1/8	MF=2*N,N=0.63	SD15
4+J8567	ACCUMULATOR 4 (EW ELECTRONS)		0 TO 65535	DECI	4/001	049-000-1/8	MF=2*N,N=0.63	SD9
4+J8568	ACCUMULATOR 6 (FD PROTONS)		0 TO 65535	DECI	4/001	051-000-1/8	MF=2*N,N=0.63	SD10
4+J8569	NORTH/SOUTH WAG, SWEEP AND PARK CNTRL		0 TO 255	DECI	1/016	106-039-1/8		LC124-018
4+J8570	EAST/WEST WAG, SWEEP AND PARK CNTRL		0 TO 255	DECI	1/016	106-047-1/8		LC124-018
J8100	SC9 MICROPROCESSOR STATUS		0 TO 8	BITS	8/001	100-000-1/8	VCO 545	
4 J8001	SC9 BROADBAND DATA SOURCE6		0 TO 5	VOLT			3000 HZ SEE TABLE 3.3-24	

Page 6.1-051

(28-Feb-78 Rev C)

PL5863011

APPENDIX 6

DATA TAPE FORMAT

THE SC-9 DATA TAPE IS 9 TRACK, 1600 BPI, ODD PARITY

THE RECORD SIZE IS 1024 16 BIT WORDS OR 2048 BYTES

THE BYTES ARE NUMBERED FROM 0 TO 2047

BYTE 0 IS PHYSICALLY THE FIRST BYTE ENCOUNTERED BY THE READ HEAD.

THE 2048 BYTE RECORD CONTAINS ALL DATA FOR 1 MASTER FRAME (16 SECONDS).

THE TAPE FORMAT SUMMARY IMMEDIATELY PRECLUDES THIS SECTION.

TERMINOLOGY:

BYTE: THE "BYTES" CORRESPOND TO EACH BYTE ON 9 TRACK TAPE. THEY ARE LISTED IN NUMERICAL ORDER.

MFR: MAINFRAME NUMBER OF THE ASSOCIATED MASTER FRAME OF DATA. MFR ALONG WITH "WORD" DEFINES THE DATA TO BE PLACED IN THE CORRESPONDING "BYTE" LOCATION ON TAPE.

WORD: TELEMETRY WORD FOR A GIVEN MFR.

TBD: TO BE DETERMINED.

***:** NOT ASSOCIATED WITH SPACECRAFT TELEMETRY DATA

NOTE:

"STATUS NSWEP" DATA IS PLACED INTO TWO SEPARATE BYTES ON TAPE (FOR A GIVEN MFR, AND WORD). THIS IS BECAUSE THIS BYTE CONTAINS DATA BITS FOR BOTH "STATUS NSP" AND "STATUS EWP" DATA.

ALSO NOTE THAT UCSD GSE TAPES WILL DIFFER IN SOME AREAS WHERE DATA FROM OTHER PAYLOADS IS TO BE PLACED.

TAPE FORMAT

File Description -

Each tape will consist of six files seperated by hardware tape marks (EOF) and terminated by a double hardware tape mark to to signify END OF INFORMATION. File and record descriptions are presented below:

File 1 - Header File

This file consists of a single record. It identifies the contents of the tape. Except for the first two bytes, the entire record is alphanumeric, recorded using the ASCII character set convention.

BYTE	TYPE	CONTENTS
1	Integer	130 (no. of Hollerith bytes in record)
2	Integer	1 (identifies record as an ID record)
3-12	Alpha	Vehicle ID (6HSCATHA)
13-22	Alpha	User ID (4HSCATHA)
23-32	Alpha	Data Format
33-42	Alpha	100% Digital Tape Number
43-52	Alpha	Acquisition Revolution Number
53-52	Alpha	Acquisition Year
63-72	Alpha	Acquisition Julian Date
73-82	Alpha	Start of Data, UT seconds
83-92	Alpha	End of Data, UT seconds
93-102	Alpha	Data Rate, bits per second
103-132	Alpha	Additional comments/blank fill

File 2 - Scan File

This file contains n 2049 byte records, where each pair of bytes is inverted according to the PDP convention. The data contained in this file are the UT time of the last good master frame before the master frame containing the out-of-sync main frame, the UT time of the master frame containing the out-of-sync main frame, the UT time of the bad main frame, the number of good

bytes in the out-of-sync main frame, and the UT time of the first good master frame after the out-of-sync main frame. The 'number of bytes' is expressed in two 8-bit bytes, and all times are contained in four 8-bit bytes, ordered 1-0-3-2.

File 3 - Event File

This file consists of all the commands sent to the spacecraft, in the form of: UT time, VTCW, and Command. Each record contains 2049 8-bit bytes. Pairs of bytes are inverted. UT time is as described in files 1. and 2. The VTCW is contained in four bytes and the commands (the commands consist of 32 bits. There are actually 33 bits, but they leave off the highest order bit) are contained in six bytes, all pairs of bytes are inverted.

File 4 - Ephemeris File

This file contains 69 parameters in 1200 8-bit bytes, encoded with ASCII characters. Each parameter has the format F15.3. The first parameter is contained in bytes 1-15, the second parameter is contained in bytes 16-30, ... and parameter 69 is contained in bytes 1001-1035. The parameters are defined in the enclosure. Each pair of 8-bit bytes have been inverted to comply with the PDP reading convention.

File 5 - Attitude File

NOTE: Not all tapes have an Attitude File, and some have the old format and others have a new version.

The old file parameters were:

	Parm. 1	Parm. 2	Parm. 3	Parm. 4
Card 1	Year	Day	BEGSEC	ENDSEC
Card 2	a	b	c	d
Card 3	RA	DEC	A	B
Card 4	Jx	Jy	Jz	$\overline{W}$

The definitions for the parameters are:

Year = Year of data
 Day = Day of data
 BEGSEC = Start time of span (Zulu seconds)
 ENDSEC = End time of span (Zulu seconds)
 a,b,d,c = Coefficients of a third degree polynomial
 expression for Theta in radians
 Theta = The angle between the spacecraft Y* axis
 and the angular momentum X,Z plane,
 $\text{Theta} = a + bT + c(T^2) + d(T^3)$
 Ti = time of interest (seconds)
 T = Ti - BEGSEC (seconds)
 RA, DEC = Right ascension and declination of the
 angular momentum X(subA) or principal
 axis (radians)
 A = The angle between the spacecraft Zs* axis
 and the principal axis.
 B = The angle between the spacecraft Yx* axis
 and the principal axis.
 Jx,Jy,Jz = The unit vector expressing the
 direction of the principal axis

in ECI coordinates.

$\bar{W}$ = Average spin rate (radians per second)

NOTE: The asterisk flags a change in definition from previous definition.

The new attitude file format is the same as the old format except for:

RA = AH
 DEC = CH
 A = AS
 B = CS

Where:

AH = Right ascension of the principal axis on ECI.
 CH = Declination of the principal axis on ECI.
 AS,CS = Euler angles for principal axis misalignment.
 AS is equivalent to ETA3 and CS is
 equivalent to ETA2 as found in the
 Output Module, and Estimation Module.

File 6 - Telemetry File

The format of the Telemetry File follows.

SCATHA TAPE FORMAT

SUMMARY

BYTES	DESCRIPTION	MNEMONIC	TYPE
1-128	Subcom ID	ISUBCM(128)	Byte
129-192	Vehicle Time Code Wd	IVTCW(16)	Integer *4
193-256	Ground Time	IGT(16)	Integer *4
257-384	N/S Elec's	IACC2(64)	Integer
385-512	N/S Ions	IACC1(64)	Integer
513-640	E/W Elec's	IACC4(64)	Integer
641-768	E/W Ions	IACC3(64)	Integer
769-1024	Fixed Ions	IACC5(128)	Integer
1025-1152	Magx	MX(64)	Integer
1153-1280	Magy	MY(64)	Integer
1281-1408	Magz	MZ(64)	Integer
1409-1424	Magx direction	MXD(16)	Byte - integer*
1425-1440	Magy direction	MYD(16)	Byte - integer*
1441-1456	Magz direction	MZD(16)	Byte - integer*
1457	+DVNS		
1458	-DVNS		
1459	+DVEW	IDV(6)	Byte - integer
1460	-DVEW		
1461	+DVFPD		
1462	-DVFPD		
1463	SVNS		
1464	SVEW	ISV(3)	Byte - integer
1465	SVFPD		

BYTES	DESCRIPTION	MNEMONIC	TYPE	MEAS.	NO.
1466	Temp. N/S head	ITNS	Byte	J4010	50
1467	Temp. E/W head	ITEW	Byte	J4011	50
1468	Temp. motor box	ITMB	Byte	J4012	50
1469	Temp. power cond. unit	ITPCU	Byte	J4013	50
1470	N/S Pos. Monitor	NSPOS	Byte	J4014	50
1471	E/W Pos. Monitor	IEWPOS	Byte	J4015	50
1472	PCU Monitor	IPCUM	Byte	J4016	50
1473-1488	N/S Analog Position	NSP(16)	Byte	J4017	50
1489-1504	E/W Analog Position	IEWP(16)	Byte	J4018	51
1505-1536	Probe Voltage 1	IPV1(16)	Integer	B8008	17
1537-1568	Probe Voltage 2	IPV2(16)	Integer	B8028	18
1569-1576	Beam Curr. Flag 1-5	IBCF(5,8)	Byte	D2001-5	38
	Beam On/Off	IBON(8)	Byte	D2006	38
	Beam Duty Cyc. Flag	IBDCF(8)	Byte	D2007	38
	Beam Focus Flag 1	IBFF1(8)	Byte	D2008	38
	Beam Focus Flag 2	IBFF2(8)	Byte	D2009	38
1577-1584	Beam Energy Flag 1-4	IBEF(4,8)	Byte	D2010-13	38
	Gun Cap Deployment Flag	IGCDF(8)	Byte	D2014	38
	Blowoff Cover Status Flag	IBCSF(8)	Byte	D2015	39
	Neut. Bias Polarity Flag	NBPF(8)	Byte	D2016	39
1585-1600	Beam Current High	IBCH(16)	Byte	D4001	38
1601-1616	Beam Current Montr.	IBCM(16)	Byte	D4008	39
1617-1632	Neutralizer Emission	NE(16)	Byte	D4009	39
1633-1648	Spibs Net Current Monitor	ISNCM(16)	Byte	D4010	39
1649-1656	Discharge Current	IDCUR(8)	Byte	D4012	39
1657	High Volt. Monitor	IHVM	Byte	D4003	39
1658	Voltage Monitor 1	IVM1	Byte	D4004	39
1659	Voltage Monitor 2	IVM2	Byte	D4005	39
1660	Beam Volt. Monitor	IBVM	Byte	D4011	39
1661	Keeper Curr. Mon.	KCM	Byte	D4014	39
1662	Keeper High Volt. Monitor	KHVM	Byte	D4015	39
1663	Accelerator Current Monitor	IACM	Byte	D4018	39
1664	Decelerator Current Monitor	IDCM	Byte	D4019	40
1665	Neutralizer Htr Current Monitor	NHCM	Byte	D4020	40
1666	Neutralizer Bias Voltage Monitor	NBVM	Byte	D4021	40
1667-1674	Non-Critical Bus Voltage Monitor	NCBV(8)	Byte	V2007	80
1675-1682	Non-Critical Bus Current 1	NCBC1(8)	Byte	V4007	78
1683-1690	Non-Critical Bus	NCBC2(8)	Byte	V4008	78

1691-1694	Current 2 Solar Array Temp 1-4	ISAT(4)	Byte	V4015-18	78-79
1695-1710	Solar Array Curr. 1	ISAC1(16)	Byte	V4019	79
1711-1726	Solar Array Curr. 2	ISAC2(16)	Byte	V4020	79
1727	Shunt Reg. Temp.	ISRT	Byte	V4021	79
1728	PCU Temp. 1	IPCUT	Byte	V4026	79
1729-1792	Deflection Control Counter Step No. Scan/Dwell	IDC(64)	Byte	J8505	51
1793-1825	Position	ISD(64)	Byte	J2504	51
1826-1856	Position	See NOTE at end of list			
1857	NS Lower Limit	NSLL	Byte	J8510	51
1858	NS Upper Limit	NSUL	Byte	J8511	51
1859	EW Lower Limit	IEWLL	Byte	J8512	51
1860	EW Upper Limit	IEWUL	Byte	J8513	51
1861	NS Wag, Sweep, and Park Control	NSPS	Byte	J8569	52
1862	EW Wag, Sweep, and Park Control	IEWPS	Byte	J8570	52
1863	Dwell Time	IDT	Byte	J8532	51
1864	No. of Dwell/Cycle	IDN	Byte	J8533	51
1865	Initial Dwell Step	ID1	Byte	J8534	51
1866	Dwell Step Size	IDS	Byte	J8535	52
1867	Accumulator Gating	IAG	Byte	J8538	52
1868	Motor Power	IMP	Byte	J8539	52
1869	Status Latching Command 1-7	LC1	Byte	J8545	52
1870	Status Latching Command 8-14	LC2	Byte	J8552	52
1871	Status Magnitude Commands (Bus) 1-8	MC1	Byte	J8559	52
1872	Status Magnitude Commands (High) 9-16	MC2	Byte	J8560	52
1873-1888	Elect. Channel 1	IEC1(16)	Byte	K4008	53
1889-1904	Elect. Channel 2	IEC2(16)	Byte	K4009	53
1905-1920	Elect. Channel 3	IEC3(16)	Byte	K4010	53
1921-1936	Elect. Channel 4	IEC4(16)	Byte	K4011	53
1937-1952	Magnetic Channel 1	IMC1(16)	Byte	K4012	53
1953-1968	Magnetic Channel 2	IMC2(16)	Byte	K4013	53
1969-1984	Magnetic Channel 3	IMC3(16)	Byte	K4014	54
1985-2000	Magnetic Channel 4	IMC4(16)	Byte	K4015	54
2001	Plus Calibration Verification	IPCV	Byte	K2001	53
	Minus Calibration	INCV	Byte	K2002	53
	Mag/Common Mode	MCMV	Byte	K2003	53
	Mode	MODE	Byte	K2004	53
2002-2013	DSAS Time Tag and Angle	IDTA(4)	Integer*4	N8008	62
2014-2048	Fill 0				

OTE: NSPC, ICSNS, IEWPC, and ICWEW in bytes 1793-1856 have been slightly scrambled on our tape. The correct, unscrambled version follows:

NOTE: NSPC, ICSNS, IEWPC, and ICWEW in bytes 1793-1856 have been slightly scrambled on our tape. The correct, unscrambled version follows:

1793 = lowest 8 bits of NSPC

1794 is: MSB = ICWEW (1 bit) - EWPC bit 11 - EWPC bit 10 -
EWPC bit 9 - ICWNS (1 bit) - NSPC bit 11 -
NSPC bit 10 - NSPC bit 9 = LSB

Where:

MSB = Most Significant Bit

LSB = Least Significant Bit

This pattern repeats until 1825

1825 is: MSB = ICWEW (1 bit) - EWPC bit 11 - EWPC bit 10 -
EWPC bit 9 - ICWNS (1 bit) - NSPC bit 11 -
NSPC bit 10 - NSPC bit 9 = LSB

(same form as 1794)

1826 = lowest 8 bits of EWPC

1827 is the same as 1794

And so forth thru 1856, where:

NSPC(16) = NS Pos. Counter; Integer; J8506; 51

ICWNS(16) = Counter-Clockwise NS; Byte; J2509; 51

IEWPC(16) = EW Pos. Counter; Integer; J8507; 51

ICWEW(16) = Counter-Clockwise Ew; Byte; J2508; 51

February 6, 1979

BYTE	HEX	WORD	DESCRIPTION
0	0	124	MAIN FRAME ID = 0
1	1	124	MAIN FRAME ID = 1
2	2	124	MAIN FRAME ID = 2
3	3	124	MAIN FRAME ID = 3
4	4	124	MAIN FRAME ID = 4
5	5	124	MAIN FRAME ID = 5
6	6	124	MAIN FRAME ID = 6
7	7	124	MAIN FRAME ID = 7
8	8	124	MAIN FRAME ID = 8
9	9	124	MAIN FRAME ID = 9
10	10	124	MAIN FRAME ID = 10
11	11	124	MAIN FRAME ID = 11
12	12	124	MAIN FRAME ID = 12
13	13	124	MAIN FRAME ID = 13
14	14	124	MAIN FRAME ID = 14
15	15	124	MAIN FRAME ID = 15
16	16	124	MAIN FRAME ID = 16
17	17	124	MAIN FRAME ID = 17
18	18	124	MAIN FRAME ID = 18
19	19	124	MAIN FRAME ID = 19
20	20	124	MAIN FRAME ID = 20
21	21	124	MAIN FRAME ID = 21
22	22	124	MAIN FRAME ID = 22
23	23	124	MAIN FRAME ID = 23
24	24	124	MAIN FRAME ID = 24
25	25	124	MAIN FRAME ID = 25
26	26	124	MAIN FRAME ID = 26
27	27	124	MAIN FRAME ID = 27
28	28	124	MAIN FRAME ID = 28
29	29	124	MAIN FRAME ID = 29
30	30	124	MAIN FRAME ID = 30
31	31	124	MAIN FRAME ID = 31
32	32	124	MAIN FRAME ID = 32
33	33	124	MAIN FRAME ID = 33
34	34	124	MAIN FRAME ID = 34
35	35	124	MAIN FRAME ID = 35
36	36	124	MAIN FRAME ID = 36
37	37	124	MAIN FRAME ID = 37
38	38	124	MAIN FRAME ID = 38
39	39	124	MAIN FRAME ID = 39
40	40	124	MAIN FRAME ID = 40
41	41	124	MAIN FRAME ID = 41
42	42	124	MAIN FRAME ID = 42
43	43	124	MAIN FRAME ID = 43
44	44	124	MAIN FRAME ID = 44
45	45	124	MAIN FRAME ID = 45
46	46	124	MAIN FRAME ID = 46
47	47	124	MAIN FRAME ID = 47
48	48	124	MAIN FRAME ID = 48
49	49	124	MAIN FRAME ID = 49
50	50	124	MAIN FRAME ID = 50
51	51	124	MAIN FRAME ID = 51
52	52	124	MAIN FRAME ID = 52
53	53	124	MAIN FRAME ID = 53

February 6, 1979

54	54	124	MAIN FRAME ID =	54
55	55	124	MAIN FRAME ID =	55
56	56	124	MAIN FRAME ID =	56
57	57	124	MAIN FRAME ID =	57
58	58	124	MAIN FRAME ID =	58
59	59	124	MAIN FRAME ID =	59
60	60	124	MAIN FRAME ID =	60
61	61	124	MAIN FRAME ID =	61
62	62	124	MAIN FRAME ID =	62
63	63	124	MAIN FRAME ID =	63
64	64	124	MAIN FRAME ID =	64
65	65	124	MAIN FRAME ID =	65
66	66	124	MAIN FRAME ID =	66
67	67	124	MAIN FRAME ID =	67
68	68	124	MAIN FRAME ID =	68
69	69	124	MAIN FRAME ID =	69
70	70	124	MAIN FRAME ID =	70
71	71	124	MAIN FRAME ID =	71
72	72	124	MAIN FRAME ID =	72
73	73	124	MAIN FRAME ID =	73
74	74	124	MAIN FRAME ID =	74
75	75	124	MAIN FRAME ID =	75
76	76	124	MAIN FRAME ID =	76
77	77	124	MAIN FRAME ID =	77
78	78	124	MAIN FRAME ID =	78
79	79	124	MAIN FRAME ID =	79
80	80	124	MAIN FRAME ID =	80
81	81	124	MAIN FRAME ID =	81
82	82	124	MAIN FRAME ID =	82
83	83	124	MAIN FRAME ID =	83
84	84	124	MAIN FRAME ID =	84
85	85	124	MAIN FRAME ID =	85
86	86	124	MAIN FRAME ID =	86
87	87	124	MAIN FRAME ID =	87
88	88	124	MAIN FRAME ID =	88
89	89	124	MAIN FRAME ID =	89
90	90	124	MAIN FRAME ID =	90
91	91	124	MAIN FRAME ID =	91
92	92	124	MAIN FRAME ID =	92
93	93	124	MAIN FRAME ID =	93
94	94	124	MAIN FRAME ID =	94
95	95	124	MAIN FRAME ID =	95
96	96	124	MAIN FRAME ID =	96
97	97	124	MAIN FRAME ID =	97
98	98	124	MAIN FRAME ID =	98
99	99	124	MAIN FRAME ID =	99
100	100	124	MAIN FRAME ID =	100
101	101	124	MAIN FRAME ID =	101
102	102	124	MAIN FRAME ID =	102
103	103	124	MAIN FRAME ID =	103
104	104	124	MAIN FRAME ID =	104
105	105	124	MAIN FRAME ID =	105
106	106	124	MAIN FRAME ID =	106
107	107	124	MAIN FRAME ID =	107

February 6, 1979

108	108	124	MAIN	FRAME	ID =	108
109	109	124	MAIN	FRAME	ID =	109
110	110	124	MAIN	FRAME	ID =	110
111	111	124	MAIN	FRAME	ID =	111
112	112	124	MAIN	FRAME	ID =	112
113	113	124	MAIN	FRAME	ID =	113
114	114	124	MAIN	FRAME	ID =	114
115	115	124	MAIN	FRAME	ID =	115
116	116	124	MAIN	FRAME	ID =	116
117	117	124	MAIN	FRAME	ID =	117
118	118	124	MAIN	FRAME	ID =	118
119	119	124	MAIN	FRAME	ID =	119
120	120	124	MAIN	FRAME	ID =	120
121	121	124	MAIN	FRAME	ID =	121
122	122	124	MAIN	FRAME	ID =	122
123	123	124	MAIN	FRAME	ID =	123
124	124	124	MAIN	FRAME	ID =	124
125	125	124	MAIN	FRAME	ID =	125
126	126	124	MAIN	FRAME	ID =	126
127	127	124	MAIN	FRAME	ID =	127
128	0	3	UTCW			3
129	0	2	UTCW			2
130	0	1	UTCW			1
131	0	0	UTCW			0
132	8	3	UTCW			3
133	8	2	UTCW			2
134	8	1	UTCW			1
135	8	0	UTCW			0
136	16	3	UTCW			3
137	16	2	UTCW			2
138	16	1	UTCW			1
139	16	0	UTCW			0
140	24	3	UTCW			3
141	24	2	UTCW			2
142	24	1	UTCW			1
143	24	0	UTCW			0
144	32	3	UTCW			3
145	32	2	UTCW			2
146	32	1	UTCW			1
147	32	0	UTCW			0
148	40	3	UTCW			3
149	40	2	UTCW			2
150	40	1	UTCW			1
151	40	0	UTCW			0
152	48	3	UTCW			3
153	48	2	UTCW			2
154	48	1	UTCW			1
155	48	0	UTCW			0
156	56	3	UTCW			3
157	56	2	UTCW			2
158	56	1	UTCW			1
159	56	0	UTCW			0
160	64	3	UTCW			3
161	64	2	UTCW			2
162	64	1	UTCW			1

February 6, 1979

163	64	0	UTCW	0
164	72	3	UTCW	3
165	72	2	UTCW	2
166	72	1	UTCW	1
167	72	0	UTCW	0
168	80	3	UTCW	3
169	80	2	UTCW	2
170	80	1	UTCW	1
171	80	0	UTCW	0
172	88	3	UTCW	3
173	88	2	UTCW	2
174	88	1	UTCW	1
175	88	0	UTCW	0
176	96	3	UTCW	3
177	96	2	UTCW	2
178	96	1	UTCW	1
179	96	0	UTCW	0
180	104	3	UTCW	3
181	104	2	UTCW	2
182	104	1	UTCW	1
183	104	0	UTCW	0
184	112	3	UTCW	3
185	112	2	UTCW	2
186	112	1	UTCW	1
187	112	0	UTCW	0
188	120	3	UTCW	3
189	120	2	UTCW	2
190	120	1	UTCW	1
191	120	0	UTCW	0
192	*	*	GROUND TIME	3
193	*	*	GROUND TIME	2
194	*	*	GROUND TIME	1
195	*	*	GROUND TIME	0
196	*	*	GROUND TIME	3
197	*	*	GROUND TIME	2
198	*	*	GROUND TIME	1
199	*	*	GROUND TIME	0
200	*	*	GROUND TIME	3
201	*	*	GROUND TIME	2
202	*	*	GROUND TIME	-1
203	*	*	GROUND TIME	0
204	*	*	GROUND TIME	-3
205	*	*	GROUND TIME	2
206	*	*	GROUND TIME	1
207	*	*	GROUND TIME	0
208	*	*	GROUND TIME	3
209	*	*	GROUND TIME	2
210	*	*	GROUND TIME	1
211	*	*	GROUND TIME	0
212	*	*	GROUND TIME	3
213	*	*	GROUND TIME	2
214	*	*	GROUND TIME	1
215	*	*	GROUND TIME	0
216	*	*	GROUND TIME	3
217	*	*	GROUND TIME	2
218	*	*	GROUND TIME	1

February 6, 1979

219	*	* GROUND TIME	0
220	*	* GROUND TIME	3
221	*	* GROUND TIME	2
222	*	* GROUND TIME	1
223	*	* GROUND TIME	0
224	*	* GROUND TIME	3
225	*	* GROUND TIME	2
226	*	* GROUND TIME	1
227	*	* GROUND TIME	0
228	*	* GROUND TIME	3
229	*	* GROUND TIME	2
230	*	* GROUND TIME	1
231	*	* GROUND TIME	0
232	*	* GROUND TIME	3
233	*	* GROUND TIME	2
234	*	* GROUND TIME	1
235	*	* GROUND TIME	0
236	*	* GROUND TIME	3
237	*	* GROUND TIME	2
238	*	* GROUND TIME	1
239	*	* GROUND TIME	0
240	*	* GROUND TIME	3
241	*	* GROUND TIME	2
242	*	* GROUND TIME	1
243	*	* GROUND TIME	0
244	*	* GROUND TIME	3
245	*	* GROUND TIME	2
246	*	* GROUND TIME	1
247	*	* GROUND TIME	0
248	*	* GROUND TIME	3
249	*	* GROUND TIME	2
250	*	* GROUND TIME	1
251	*	* GROUND TIME	0
252	*	* GROUND TIME	3
253	*	* GROUND TIME	2
254	*	* GROUND TIME	1
255	*	* GROUND TIME	0
256	0	105 NS ELEC LOW BYTE	
257	0	104 NS ELEC HIGH BYTE	
258	2	105 NS ELEC LOW BYTE	
259	2	104 NS ELEC HIGH BYTE	
260	4	105 NS ELEC LOW BYTE	
261	4	104 NS ELEC HIGH BYTE	
262	6	105 NS ELEC LOW BYTE	
263	6	104 NS ELEC HIGH BYTE	
264	8	105 NS ELEC LOW BYTE	
265	8	104 NS ELEC HIGH BYTE	
266	10	105 NS ELEC LOW BYTE	
267	10	104 NS ELEC HIGH BYTE	
268	12	105 NS ELEC LOW BYTE	
269	12	104 NS ELEC HIGH BYTE	
270	14	105 NS ELEC LOW BYTE	
271	14	104 NS ELEC HIGH BYTE	
272	16	105 NS ELEC LOW BYTE	
273	16	104 NS ELEC HIGH BYTE	
274	18	105 NS ELEC LOW BYTE	

February 6, 1975

275	18	104	NS	ELEC	HIGH BYTE
276	20	105	NS	ELEC	LOW BYTE
277	20	104	NS	ELEC	HIGH BYTE
278	22	105	NS	ELEC	LOW BYTE
279	22	104	NS	ELEC	HIGH BYTE
280	24	105	NS	ELEC	LOW BYTE
281	24	104	NS	ELEC	HIGH BYTE
282	26	105	NS	ELEC	LOW BYTE
283	26	104	NS	ELEC	HIGH BYTE
284	28	105	NS	ELEC	LOW BYTE
285	28	104	NS	ELEC	HIGH BYTE
286	30	105	NS	ELEC	LOW BYTE
287	30	104	NS	ELEC	HIGH BYTE
288	32	105	NS	ELEC	LOW BYTE
289	32	104	NS	ELEC	HIGH BYTE
290	34	105	NS	ELEC	LOW BYTE
291	34	104	NS	ELEC	HIGH BYTE
292	36	105	NS	ELEC	LOW BYTE
293	36	104	NS	ELEC	HIGH BYTE
294	38	105	NS	ELEC	LOW BYTE
295	38	104	NS	ELEC	HIGH BYTE
296	40	105	NS	ELEC	LOW BYTE
297	40	104	NS	ELEC	HIGH BYTE
298	42	105	NS	ELEC	LOW BYTE
299	42	104	NS	ELEC	HIGH BYTE
300	44	105	NS	ELEC	LOW BYTE
301	44	104	NS	ELEC	HIGH BYTE
302	46	105	NS	ELEC	LOW BYTE
303	46	104	NS	ELEC	HIGH BYTE
304	48	105	NS	ELEC	LOW BYTE
305	48	104	NS	ELEC	HIGH BYTE
306	50	105	NS	ELEC	LOW BYTE
307	50	104	NS	ELEC	HIGH BYTE
308	52	105	NS	ELEC	LOW BYTE
309	52	104	NS	ELEC	HIGH BYTE
310	54	105	NS	ELEC	LOW BYTE
311	54	104	NS	ELEC	HIGH BYTE
312	56	105	NS	ELEC	LOW BYTE
313	56	104	NS	ELEC	HIGH BYTE
314	58	105	NS	ELEC	LOW BYTE
315	58	104	NS	ELEC	HIGH BYTE
316	60	105	NS	ELEC	LOW BYTE
317	60	104	NS	ELEC	HIGH BYTE
318	62	105	NS	ELEC	LOW BYTE
319	62	104	NS	ELEC	HIGH BYTE
320	64	105	NS	ELEC	LOW BYTE
321	64	104	NS	ELEC	HIGH BYTE
322	66	105	NS	ELEC	LOW BYTE
323	66	104	NS	ELEC	HIGH BYTE
324	68	105	NS	ELEC	LOW BYTE
325	68	104	NS	ELEC	HIGH BYTE
326	70	105	NS	ELEC	LOW BYTE
327	70	104	NS	ELEC	HIGH BYTE
328	72	105	NS	ELEC	LOW BYTE
329	72	104	NS	ELEC	HIGH BYTE
330	74	105	NS	ELEC	LOW BYTE

February 6, 1979

331	74	104	NS	ELEC	HIGH BYTE
332	76	105	NS	ELEC	LOW BYTE
333	76	104	NS	ELEC	HIGH BYTE
334	78	105	NS	ELEC	LOW BYTE
335	78	104	NS	ELEC	HIGH BYTE
336	80	105	NS	ELEC	LOW BYTE
337	80	104	NS	ELEC	HIGH BYTE
338	82	105	NS	ELEC	LOW BYTE
339	82	104	NS	ELEC	HIGH BYTE
340	84	105	NS	ELEC	LOW BYTE
341	84	104	NS	ELEC	HIGH BYTE
342	86	105	NS	ELEC	LOW BYTE
343	86	104	NS	ELEC	HIGH BYTE
344	88	105	NS	ELEC	LOW BYTE
345	88	104	NS	ELEC	HIGH BYTE
346	90	105	NS	ELEC	LOW BYTE
347	90	104	NS	ELEC	HIGH BYTE
348	92	105	NS	ELEC	LOW BYTE
349	92	104	NS	ELEC	HIGH BYTE
350	94	105	NS	ELEC	LOW BYTE
351	94	104	NS	ELEC	HIGH BYTE
352	96	105	NS	ELEC	LOW BYTE
353	96	104	NS	ELEC	HIGH BYTE
354	98	105	NS	ELEC	LOW BYTE
355	98	104	NS	ELEC	HIGH BYTE
356	100	105	NS	ELEC	LOW BYTE
357	100	104	NS	ELEC	HIGH BYTE
358	102	105	NS	ELEC	LOW BYTE
359	102	104	NS	ELEC	HIGH BYTE
360	104	105	NS	ELEC	LOW BYTE
361	104	104	NS	ELEC	HIGH BYTE
362	106	105	NS	ELEC	LOW BYTE
363	106	104	NS	ELEC	HIGH BYTE
364	108	105	NS	ELEC	LOW BYTE
365	108	104	NS	ELEC	HIGH BYTE
366	110	105	NS	ELEC	LOW BYTE
367	110	104	NS	ELEC	HIGH BYTE
368	112	105	NS	ELEC	LOW BYTE
369	112	104	NS	ELEC	HIGH BYTE
370	114	105	NS	ELEC	LOW BYTE
371	114	104	NS	ELEC	HIGH BYTE
372	116	105	NS	ELEC	LOW BYTE
373	116	104	NS	ELEC	HIGH BYTE
374	118	105	NS	ELEC	LOW BYTE
375	118	104	NS	ELEC	HIGH BYTE
376	120	105	NS	ELEC	LOW BYTE
377	120	104	NS	ELEC	HIGH BYTE
378	122	105	NS	ELEC	LOW BYTE
379	122	104	NS	ELEC	HIGH BYTE
380	124	105	NS	ELEC	LOW BYTE
381	124	104	NS	ELEC	HIGH BYTE
382	126	105	NS	ELEC	LOW BYTE
383	126	104	NS	ELEC	HIGH BYTE
384	1	105	NS	IONS	LOW BYTE
385	1	104	NS	IONS	HIGH BYTE
386	3	105	NS	IONS	LOW BYTE

February 6, 1979

387	3	104	NS	IONS	HIGH BYTE
388	5	105	NS	IONS	LOW BYTE
389	5	104	NS	IONS	HIGH BYTE
390	7	105	NS	IONS	LOW BYTE
391	7	104	NS	IONS	HIGH BYTE
392	9	105	NS	IONS	LOW BYTE
393	9	104	NS	IONS	HIGH BYTE
394	11	105	NS	IONS	LOW BYTE
395	11	104	NS	IONS	HIGH BYTE
396	13	105	NS	IONS	LOW BYTE
397	13	104	NS	IONS	HIGH BYTE
398	15	105	NS	IONS	LOW BYTE
399	15	104	NS	IONS	HIGH BYTE
400	17	105	NS	IONS	LOW BYTE
401	17	104	NS	IONS	HIGH BYTE
402	19	105	NS	IONS	LOW BYTE
403	19	104	NS	IONS	HIGH BYTE
404	21	105	NS	IONS	LOW BYTE
405	21	104	NS	IONS	HIGH BYTE
406	23	105	NS	IONS	LOW BYTE
407	23	104	NS	IONS	HIGH BYTE
408	25	105	NS	IONS	LOW BYTE
409	25	104	NS	IONS	HIGH BYTE
410	27	105	NS	IONS	LOW BYTE
411	27	104	NS	IONS	HIGH BYTE
412	29	105	NS	IONS	LOW BYTE
413	29	104	NS	IONS	HIGH BYTE
414	31	105	NS	IONS	LOW BYTE
415	31	104	NS	IONS	HIGH BYTE
416	33	105	NS	IONS	LOW BYTE
417	33	104	NS	IONS	HIGH BYTE
418	35	105	NS	IONS	LOW BYTE
419	35	104	NS	IONS	HIGH BYTE
420	37	105	NS	IONS	LOW BYTE
421	37	104	NS	IONS	HIGH BYTE
422	39	105	NS	IONS	LOW BYTE
423	39	104	NS	IONS	HIGH BYTE
424	41	105	NS	IONS	LOW BYTE
425	41	104	NS	IONS	HIGH BYTE
426	43	105	NS	IONS	LOW BYTE
427	43	104	NS	IONS	HIGH BYTE
428	45	105	NS	IONS	LOW BYTE
429	45	104	NS	IONS	HIGH BYTE
430	47	105	NS	IONS	LOW BYTE
431	47	104	NS	IONS	HIGH BYTE
432	49	105	NS	IONS	LOW BYTE
433	49	104	NS	IONS	HIGH BYTE
434	51	105	NS	IONS	LOW BYTE
435	51	104	NS	IONS	HIGH BYTE
436	53	105	NS	IONS	LOW BYTE
437	53	104	NS	IONS	HIGH BYTE
438	55	105	NS	IONS	LOW BYTE
439	55	104	NS	IONS	HIGH BYTE
440	57	105	NS	IONS	LOW BYTE
441	57	104	NS	IONS	HIGH BYTE
442	59	105	NS	IONS	LOW BYTE

February 6, 1979

443	59	104	NS	IONS	HIGH BYTE
444	61	105	NS	IONS	LOW BYTE
445	61	104	NS	IONS	HIGH BYTE
446	63	105	NS	IONS	LOW BYTE
447	63	104	NS	IONS	HIGH BYTE
448	65	105	NS	IONS	LOW BYTE
449	65	104	NS	IONS	HIGH BYTE
450	67	105	NS	IONS	LOW BYTE
451	67	104	NS	IONS	HIGH BYTE
452	69	105	NS	IONS	LOW BYTE
453	69	104	NS	IONS	HIGH BYTE
454	71	105	NS	IONS	LOW BYTE
455	71	104	NS	IONS	HIGH BYTE
456	73	105	NS	IONS	LOW BYTE
457	73	104	NS	IONS	HIGH BYTE
458	75	105	NS	IONS	LOW BYTE
459	75	104	NS	IONS	HIGH BYTE
460	77	105	NS	IONS	LOW BYTE
461	77	104	NS	IONS	HIGH BYTE
462	79	105	NS	IONS	LOW BYTE
463	79	104	NS	IONS	HIGH BYTE
464	81	105	NS	IONS	LOW BYTE
465	81	104	NS	IONS	HIGH BYTE
466	83	105	NS	IONS	LOW BYTE
467	83	104	NS	IONS	HIGH BYTE
468	85	105	NS	IONS	LOW BYTE
469	85	104	NS	IONS	HIGH BYTE
470	87	105	NS	IONS	LOW BYTE
471	87	104	NS	IONS	HIGH BYTE
472	89	105	NS	IONS	LOW BYTE
473	89	104	NS	IONS	HIGH BYTE
474	91	105	NS	IONS	LOW BYTE
475	91	104	NS	IONS	HIGH BYTE
476	93	105	NS	IONS	LOW BYTE
477	93	104	NS	IONS	HIGH BYTE
478	95	105	NS	IONS	LOW BYTE
479	95	104	NS	IONS	HIGH BYTE
480	97	105	NS	IONS	LOW BYTE
481	97	104	NS	IONS	HIGH BYTE
482	99	105	NS	IONS	LOW BYTE
483	99	104	NS	IONS	HIGH BYTE
484	101	105	NS	IONS	LOW BYTE
485	101	104	NS	IONS	HIGH BYTE
486	103	105	NS	IONS	LOW BYTE
487	103	104	NS	IONS	HIGH BYTE
488	105	105	NS	IONS	LOW BYTE
489	105	104	NS	IONS	HIGH BYTE
490	107	105	NS	IONS	LOW BYTE
491	107	104	NS	IONS	HIGH BYTE
492	109	105	NS	IONS	LOW BYTE
493	109	104	NS	IONS	HIGH BYTE
494	111	105	NS	IONS	LOW BYTE
495	111	104	NS	IONS	HIGH BYTE
496	113	105	NS	IONS	LOW BYTE
497	113	104	NS	IONS	HIGH BYTE
498	115	105	NS	IONS	LOW BYTE

February 6, 1979

500	110	104	NS	IONS	HIGH BYTE
501	111	105	NS	IONS	LOW BYTE
502	112	104	NS	IONS	HIGH BYTE
503	113	105	NS	IONS	LOW BYTE
504	114	104	NS	IONS	HIGH BYTE
505	115	105	NS	IONS	LOW BYTE
506	116	104	NS	IONS	HIGH BYTE
507	117	105	NS	IONS	LOW BYTE
508	118	104	NS	IONS	HIGH BYTE
509	119	105	NS	IONS	LOW BYTE
510	120	104	NS	IONS	HIGH BYTE
511	121	105	NS	IONS	LOW BYTE
512	0	50	EW	ELEC	LOW BYTE
513	0	49	EW	ELEC	HIGH BYTE
514	2	50	EW	ELEC	LOW BYTE
515	2	49	EW	ELEC	HIGH BYTE
516	4	50	EW	ELEC	LOW BYTE
517	4	49	EW	ELEC	HIGH BYTE
518	6	50	EW	ELEC	LOW BYTE
519	6	49	EW	ELEC	HIGH BYTE
520	8	50	EW	ELEC	LOW BYTE
521	8	49	EW	ELEC	HIGH BYTE
522	10	50	EW	ELEC	LOW BYTE
523	10	49	EW	ELEC	HIGH BYTE
524	12	50	EW	ELEC	LOW BYTE
525	12	49	EW	ELEC	HIGH BYTE
526	14	50	EW	ELEC	LOW BYTE
527	14	49	EW	ELEC	HIGH BYTE
528	16	50	EW	ELEC	LOW BYTE
529	16	49	EW	ELEC	HIGH BYTE
530	18	50	EW	ELEC	LOW BYTE
531	18	49	EW	ELEC	HIGH BYTE
532	20	50	EW	ELEC	LOW BYTE
533	20	49	EW	ELEC	HIGH BYTE
534	22	50	EW	ELEC	LOW BYTE
535	22	49	EW	ELEC	HIGH BYTE
536	24	50	EW	ELEC	LOW BYTE
537	24	49	EW	ELEC	HIGH BYTE
538	26	50	EW	ELEC	LOW BYTE
539	26	49	EW	ELEC	HIGH BYTE
540	28	50	EW	ELEC	LOW BYTE
541	28	49	EW	ELEC	HIGH BYTE
542	30	50	EW	ELEC	LOW BYTE
543	30	49	EW	ELEC	HIGH BYTE
544	32	50	EW	ELEC	LOW BYTE
545	32	49	EW	ELEC	HIGH BYTE
546	34	50	EW	ELEC	LOW BYTE
547	34	49	EW	ELEC	HIGH BYTE
548	36	50	EW	ELEC	LOW BYTE
549	36	49	EW	ELEC	HIGH BYTE
550	38	50	EW	ELEC	LOW BYTE
551	38	49	EW	ELEC	HIGH BYTE
552	40	50	EW	ELEC	LOW BYTE
553	40	49	EW	ELEC	HIGH BYTE
554	42	50	EW	ELEC	LOW BYTE

February 6, 1979

555	42	49	EW	ELEC	HIGH BYTE
556	44	50	EW	ELEC	LOW BYTE
557	44	49	EW	ELEC	HIGH BYTE
558	46	50	EW	ELEC	LOW BYTE
559	46	49	EW	ELEC	HIGH BYTE
560	48	50	EW	ELEC	LOW BYTE
561	48	49	EW	ELEC	HIGH BYTE
562	50	50	EW	ELEC	LOW BYTE
563	50	49	EW	ELEC	HIGH BYTE
564	52	50	EW	ELEC	LOW BYTE
565	52	49	EW	ELEC	HIGH BYTE
566	54	50	EW	ELEC	LOW BYTE
567	54	49	EW	ELEC	HIGH BYTE
568	56	50	EW	ELEC	LOW BYTE
569	56	49	EW	ELEC	HIGH BYTE
570	58	50	EW	ELEC	LOW BYTE
571	58	49	EW	ELEC	HIGH BYTE
572	60	50	EW	ELEC	LOW BYTE
573	60	49	EW	ELEC	HIGH BYTE
574	62	50	EW	ELEC	LOW BYTE
575	62	49	EW	ELEC	HIGH BYTE
576	64	50	EW	ELEC	LOW BYTE
577	64	49	EW	ELEC	HIGH BYTE
578	66	50	EW	ELEC	LOW BYTE
579	66	49	EW	ELEC	HIGH BYTE
580	68	50	EW	ELEC	LOW BYTE
581	68	49	EW	ELEC	HIGH BYTE
582	70	50	EW	ELEC	LOW BYTE
583	70	49	EW	ELEC	HIGH BYTE
584	72	50	EW	ELEC	LOW BYTE
585	72	49	EW	ELEC	HIGH BYTE
586	74	50	EW	ELEC	LOW BYTE
587	74	49	EW	ELEC	HIGH BYTE
588	76	50	EW	ELEC	LOW BYTE
589	76	49	EW	ELEC	HIGH BYTE
590	78	50	EW	ELEC	LOW BYTE
591	78	49	EW	ELEC	HIGH BYTE
592	80	50	EW	ELEC	LOW BYTE
593	80	49	EW	ELEC	HIGH BYTE
594	82	50	EW	ELEC	LOW BYTE
595	82	49	EW	ELEC	HIGH BYTE
596	84	50	EW	ELEC	LOW BYTE
597	84	49	EW	ELEC	HIGH BYTE
598	86	50	EW	ELEC	LOW BYTE
599	86	49	EW	ELEC	HIGH BYTE
600	88	50	EW	ELEC	LOW BYTE
601	88	49	EW	ELEC	HIGH BYTE
602	90	50	EW	ELEC	LOW BYTE
603	90	49	EW	ELEC	HIGH BYTE
604	92	50	EW	ELEC	LOW BYTE
605	92	49	EW	ELEC	HIGH BYTE
606	94	50	EW	ELEC	LOW BYTE
607	94	49	EW	ELEC	HIGH BYTE
608	96	50	EW	ELEC	LOW BYTE
609	96	49	EW	ELEC	HIGH BYTE

February 6, 1979

610	98	50	EW	ELEC	LOW BYTE
611	98	49	EW	ELEC	HIGH BYTE
612	100	50	EW	ELEC	LOW BYTE
613	100	49	EW	ELEC	HIGH BYTE
614	102	50	EW	ELEC	LOW BYTE
615	102	49	EW	ELEC	HIGH BYTE
616	104	50	EW	ELEC	LOW BYTE
617	104	49	EW	ELEC	HIGH BYTE
618	106	50	EW	ELEC	LOW BYTE
619	106	49	EW	ELEC	HIGH BYTE
620	108	50	EW	ELEC	LOW BYTE
621	108	49	EW	ELEC	HIGH BYTE
622	110	50	EW	ELEC	LOW BYTE
623	110	49	EW	ELEC	HIGH BYTE
624	112	50	EW	ELEC	LOW BYTE
625	112	49	EW	ELEC	HIGH BYTE
626	114	50	EW	ELEC	LOW BYTE
627	114	49	EW	ELEC	HIGH BYTE
628	116	50	EW	ELEC	LOW BYTE
629	116	49	EW	ELEC	HIGH BYTE
630	118	50	EW	ELEC	LOW BYTE
631	118	49	EW	ELEC	HIGH BYTE
632	120	50	EW	ELEC	LOW BYTE
633	120	49	EW	ELEC	HIGH BYTE
634	122	50	EW	ELEC	LOW BYTE
635	122	49	EW	ELEC	HIGH BYTE
636	124	50	EW	ELEC	LOW BYTE
637	124	49	EW	ELEC	HIGH BYTE
638	126	50	EW	ELEC	LOW BYTE
639	126	49	EW	ELEC	HIGH BYTE
640	1	50	EW	IONS	LOW BYTE
641	1	49	EW	IONS	HIGH BYTE
642	3	50	EW	IONS	LOW BYTE
643	3	49	EW	IONS	HIGH BYTE
644	5	50	EW	IONS	LOW BYTE
645	5	49	EW	IONS	HIGH BYTE
646	7	50	EW	IONS	LOW BYTE
647	7	49	EW	IONS	HIGH BYTE
648	9	50	EW	IONS	LOW BYTE
649	9	49	EW	IONS	HIGH BYTE
650	11	50	EW	IONS	LOW BYTE
651	11	49	EW	IONS	HIGH BYTE
652	13	50	EW	IONS	LOW BYTE
653	13	49	EW	IONS	HIGH BYTE
654	15	50	EW	IONS	LOW BYTE
655	15	49	EW	IONS	HIGH BYTE
656	17	50	EW	IONS	LOW BYTE
657	17	49	EW	IONS	HIGH BYTE
658	19	50	EW	IONS	LOW BYTE
659	19	49	EW	IONS	HIGH BYTE
660	21	50	EW	IONS	LOW BYTE
661	21	49	EW	IONS	HIGH BYTE
662	23	50	EW	IONS	LOW BYTE
663	23	49	EW	IONS	HIGH BYTE
664	25	50	EW	IONS	LOW BYTE
665	25	49	EW	IONS	HIGH BYTE

February 6, 1979

666	27	50	EW	IONS	LOW	BYTE
667	27	49	EW	IONS	HIGH	BYTE
668	29	50	EW	IONS	LOW	BYTE
669	29	49	EW	IONS	HIGH	BYTE
670	31	50	EW	IONS	LOW	BYTE
671	31	49	EW	IONS	HIGH	BYTE
672	33	50	EW	IONS	LOW	BYTE
673	33	49	EW	IONS	HIGH	BYTE
674	35	50	EW	IONS	LOW	BYTE
675	35	49	EW	IONS	HIGH	BYTE
676	37	50	EW	IONS	LOW	BYTE
677	37	49	EW	IONS	HIGH	BYTE
678	39	50	EW	IONS	LOW	BYTE
679	39	49	EW	IONS	HIGH	BYTE
680	41	50	EW	IONS	LOW	BYTE
681	41	49	EW	IONS	HIGH	BYTE
682	43	50	EW	IONS	LOW	BYTE
683	43	49	EW	IONS	HIGH	BYTE
684	45	50	EW	IONS	LOW	BYTE
685	45	49	EW	IONS	HIGH	BYTE
686	47	50	EW	IONS	LOW	BYTE
687	47	49	EW	IONS	HIGH	BYTE
688	49	50	EW	IONS	LOW	BYTE
689	49	49	EW	IONS	HIGH	BYTE
690	51	50	EW	IONS	LOW	BYTE
691	51	49	EW	IONS	HIGH	BYTE
692	53	50	EW	IONS	LOW	BYTE
693	53	49	EW	IONS	HIGH	BYTE
694	55	50	EW	IONS	LOW	BYTE
695	55	49	EW	IONS	HIGH	BYTE
696	57	50	EW	IONS	LOW	BYTE
697	57	49	EW	IONS	HIGH	BYTE
698	59	50	EW	IONS	LOW	BYTE
699	59	49	EW	IONS	HIGH	BYTE
700	61	50	EW	IONS	LOW	BYTE
701	61	49	EW	IONS	HIGH	BYTE
702	63	50	EW	IONS	LOW	BYTE
703	63	49	EW	IONS	HIGH	BYTE
704	65	50	EW	IONS	LOW	BYTE
705	65	49	EW	IONS	HIGH	BYTE
706	67	50	EW	IONS	LOW	BYTE
707	67	49	EW	IONS	HIGH	BYTE
708	69	50	EW	IONS	LOW	BYTE
709	69	49	EW	IONS	HIGH	BYTE
710	71	50	EW	IONS	LOW	BYTE
711	71	49	EW	IONS	HIGH	BYTE
712	73	50	EW	IONS	LOW	BYTE
713	73	49	EW	IONS	HIGH	BYTE
714	75	50	EW	IONS	LOW	BYTE
715	75	49	EW	IONS	HIGH	BYTE
716	77	50	EW	IONS	LOW	BYTE
717	77	49	EW	IONS	HIGH	BYTE
718	79	50	EW	IONS	LOW	BYTE
719	79	49	EW	IONS	HIGH	BYTE
720	81	50	EW	IONS	LOW	BYTE
721	81	49	EW	IONS	HIGH	BYTE

February 6, 1979

722	83	50	EW	IONS	LOW	BYTE
723	83	49	EW	IONS	HIGH	BYTE
724	85	50	EW	IONS	LOW	BYTE
725	85	49	EW	IONS	HIGH	BYTE
726	87	50	EW	IONS	LOW	BYTE
727	87	49	EW	IONS	HIGH	BYTE
728	89	50	EW	IONS	LOW	BYTE
729	89	49	EW	IONS	HIGH	BYTE
730	91	50	EW	IONS	LOW	BYTE
731	91	49	EW	IONS	HIGH	BYTE
732	93	50	EW	IONS	LOW	BYTE
733	93	49	EW	IONS	HIGH	BYTE
734	95	50	EW	IONS	LOW	BYTE
735	95	49	EW	IONS	HIGH	BYTE
736	97	50	EW	IONS	LOW	BYTE
737	97	49	EW	IONS	HIGH	BYTE
738	99	50	EW	IONS	LOW	BYTE
739	99	49	EW	IONS	HIGH	BYTE
740	101	50	EW	IONS	LOW	BYTE
741	101	49	EW	IONS	HIGH	BYTE
742	103	50	EW	IONS	LOW	BYTE
743	103	49	EW	IONS	HIGH	BYTE
744	105	50	EW	IONS	LOW	BYTE
745	105	49	EW	IONS	HIGH	BYTE
746	107	50	EW	IONS	LOW	BYTE
747	107	49	EW	IONS	HIGH	BYTE
748	109	50	EW	IONS	LOW	BYTE
749	109	49	EW	IONS	HIGH	BYTE
750	111	50	EW	IONS	LOW	BYTE
751	111	49	EW	IONS	HIGH	BYTE
752	113	50	EW	IONS	LOW	BYTE
753	113	49	EW	IONS	HIGH	BYTE
754	115	50	EW	IONS	LOW	BYTE
755	115	49	EW	IONS	HIGH	BYTE
756	117	50	EW	IONS	LOW	BYTE
757	117	49	EW	IONS	HIGH	BYTE
758	119	50	EW	IONS	LOW	BYTE
759	119	49	EW	IONS	HIGH	BYTE
760	121	50	EW	IONS	LOW	BYTE
761	121	49	EW	IONS	HIGH	BYTE
762	123	50	EW	IONS	LOW	BYTE
763	123	49	EW	IONS	HIGH	BYTE
764	125	50	EW	IONS	LOW	BYTE
765	125	49	EW	IONS	HIGH	BYTE
766	127	50	EW	IONS	LOW	BYTE
767	127	49	EW	IONS	HIGH	BYTE
768	0	52	FD	IONS	LOW	BYTE
769	0	51	FD	IONS	HIGH	BYTE
770	1	52	FD	IONS	LOW	BYTE
771	1	51	FD	IONS	HIGH	BYTE
772	2	52	FD	IONS	LOW	BYTE
773	2	51	FD	IONS	HIGH	BYTE
774	3	52	FD	IONS	LOW	BYTE
775	3	51	FD	IONS	HIGH	BYTE
776	4	52	FD	IONS	LOW	BYTE
777	4	51	FD	IONS	HIGH	BYTE

February 6, 1979

778	5	52	FD	IONS	LOW BYTE
779	5	51	FD	IONS	HIGH BYTE
780	6	52	FD	IONS	LOW BYTE
781	6	51	FD	IONS	HIGH BYTE
782	7	52	FD	IONS	LOW BYTE
783	7	51	FD	IONS	HIGH BYTE
784	8	52	FD	IONS	LOW BYTE
785	8	51	FD	IONS	HIGH BYTE
786	9	52	FD	IONS	LOW BYTE
787	9	51	FD	IONS	HIGH BYTE
788	10	52	FD	IONS	LOW BYTE
789	10	51	FD	IONS	HIGH BYTE
790	11	52	FD	IONS	LOW BYTE
791	11	51	FD	IONS	HIGH BYTE
792	12	52	FD	IONS	LOW BYTE
793	12	51	FD	IONS	HIGH BYTE
794	13	52	FD	IONS	LOW BYTE
795	13	51	FD	IONS	HIGH BYTE
796	14	52	FD	IONS	LOW BYTE
797	14	51	FD	IONS	HIGH BYTE
798	15	52	FD	IONS	LOW BYTE
799	15	51	FD	IONS	HIGH BYTE
800	16	52	FD	IONS	LOW BYTE
801	16	51	FD	IONS	HIGH BYTE
802	17	52	FD	IONS	LOW BYTE
803	17	51	FD	IONS	HIGH BYTE
804	18	52	FD	IONS	LOW BYTE
805	18	51	FD	IONS	HIGH BYTE
806	19	52	FD	IONS	LOW BYTE
807	19	51	FD	IONS	HIGH BYTE
808	20	52	FD	IONS	LOW BYTE
809	20	51	FD	IONS	HIGH BYTE
810	21	52	FD	IONS	LOW BYTE
811	21	51	FD	IONS	HIGH BYTE
812	22	52	FD	IONS	LOW BYTE
813	22	51	FD	IONS	HIGH BYTE
814	23	52	FD	IONS	LOW BYTE
815	23	51	FD	IONS	HIGH BYTE
816	24	52	FD	IONS	LOW BYTE
817	24	51	FD	IONS	HIGH BYTE
818	25	52	FD	IONS	LOW BYTE
819	25	51	FD	IONS	HIGH BYTE
820	26	52	FD	IONS	LOW BYTE
821	26	51	FD	IONS	HIGH BYTE
822	27	52	FD	IONS	LOW BYTE
823	27	51	FD	IONS	HIGH BYTE
824	28	52	FD	IONS	LOW BYTE
825	28	51	FD	IONS	HIGH BYTE
826	29	52	FD	IONS	LOW BYTE
827	29	51	FD	IONS	HIGH BYTE
828	30	52	FD	IONS	LOW BYTE
829	30	51	FD	IONS	HIGH BYTE
830	31	52	FD	IONS	LOW BYTE
831	31	51	FD	IONS	HIGH BYTE

February 6, 1979

832	32	52	FD	IONS	LOW	BYTE
833	32	51	FD	IONS	HIGH	BYTE
834	33	52	FD	IONS	LOW	BYTE
835	33	51	FD	IONS	HIGH	BYTE
836	34	52	FD	IONS	LOW	BYTE
837	34	51	FD	IONS	HIGH	BYTE
838	35	52	FD	IONS	LOW	BYTE
839	35	51	FD	IONS	HIGH	BYTE
840	36	52	FD	IONS	LOW	BYTE
841	36	51	FD	IONS	HIGH	BYTE
842	37	52	FD	IONS	LOW	BYTE
843	37	51	FD	IONS	HIGH	BYTE
844	38	52	FD	IONS	LOW	BYTE
845	38	51	FD	IONS	HIGH	BYTE
846	39	52	FD	IONS	LOW	BYTE
847	39	51	FD	IONS	HIGH	BYTE
848	40	52	FD	IONS	LOW	BYTE
849	40	51	FD	IONS	HIGH	BYTE
850	41	52	FD	IONS	LOW	BYTE
851	41	51	FD	IONS	HIGH	BYTE
852	42	52	FD	IONS	LOW	BYTE
853	42	51	FD	IONS	HIGH	BYTE
854	43	52	FD	IONS	LOW	BYTE
855	43	51	FD	IONS	HIGH	BYTE
856	44	52	FD	IONS	LOW	BYTE
857	44	51	FD	IONS	HIGH	BYTE
858	45	52	FD	IONS	LOW	BYTE
859	45	51	FD	IONS	HIGH	BYTE
860	46	52	FD	IONS	LOW	BYTE
861	46	51	FD	IONS	HIGH	BYTE
862	47	52	FD	IONS	LOW	BYTE
863	47	51	FD	IONS	HIGH	BYTE
864	48	52	FD	IONS	LOW	BYTE
865	48	51	FD	IONS	HIGH	BYTE
866	49	52	FD	IONS	LOW	BYTE
867	49	51	FD	IONS	HIGH	BYTE
868	50	52	FD	IONS	LOW	BYTE
869	50	51	FD	IONS	HIGH	BYTE
870	51	52	FD	IONS	LOW	BYTE
871	51	51	FD	IONS	HIGH	BYTE
872	52	52	FD	IONS	LOW	BYTE
873	52	51	FD	IONS	HIGH	BYTE
874	53	52	FD	IONS	LOW	BYTE
875	53	51	FD	IONS	HIGH	BYTE
876	54	52	FD	IONS	LOW	BYTE
877	54	51	FD	IONS	HIGH	BYTE
878	55	52	FD	IONS	LOW	BYTE
879	55	51	FD	IONS	HIGH	BYTE
880	56	52	FD	IONS	LOW	BYTE
881	56	51	FD	IONS	HIGH	BYTE
882	57	52	FD	IONS	LOW	BYTE
883	57	51	FD	IONS	HIGH	BYTE
884	58	52	FD	IONS	LOW	BYTE
885	58	51	FD	IONS	HIGH	BYTE
886	59	52	FD	IONS	LOW	BYTE
887	59	51	FD	IONS	HIGH	BYTE

February 6, 1979

888	60	52	FD	IONS	LOW	BYTE
889	60	51	FD	IONS	HIGH	BYTE
890	61	52	FD	IONS	LOW	BYTE
891	61	51	FD	IONS	HIGH	BYTE
892	62	52	FD	IONS	LOW	BYTE
893	62	51	FD	IONS	HIGH	BYTE
894	63	52	FD	IONS	LOW	BYTE
895	63	51	FD	IONS	HIGH	BYTE
896	64	52	FD	IONS	LOW	BYTE
897	64	51	FD	IONS	HIGH	BYTE
898	65	52	FD	IONS	LOW	BYTE
899	65	51	FD	IONS	HIGH	BYTE
900	66	52	FD	IONS	LOW	BYTE
901	66	51	FD	IONS	HIGH	BYTE
902	67	52	FD	IONS	LOW	BYTE
903	67	51	FD	IONS	HIGH	BYTE
904	68	52	FD	IONS	LOW	BYTE
905	68	51	FD	IONS	HIGH	BYTE
906	69	52	FD	IONS	LOW	BYTE
907	69	51	FD	IONS	HIGH	BYTE
908	70	52	FD	IONS	LOW	BYTE
909	70	51	FD	IONS	HIGH	BYTE
910	71	52	FD	IONS	LOW	BYTE
911	71	51	FD	IONS	HIGH	BYTE
912	72	52	FD	IONS	LOW	BYTE
913	72	51	FD	IONS	HIGH	BYTE
914	73	52	FD	IONS	LOW	BYTE
915	73	51	FD	IONS	HIGH	BYTE
916	74	52	FD	IONS	LOW	BYTE
917	74	51	FD	IONS	HIGH	BYTE
918	75	52	FD	IONS	LOW	BYTE
919	75	51	FD	IONS	HIGH	BYTE
920	76	52	FD	IONS	LOW	BYTE
921	76	51	FD	IONS	HIGH	BYTE
922	77	52	FD	IONS	LOW	BYTE
923	77	51	FD	IONS	HIGH	BYTE
924	78	52	FD	IONS	LOW	BYTE
925	78	51	FD	IONS	HIGH	BYTE
926	79	52	FD	IONS	LOW	BYTE
927	79	51	FD	IONS	HIGH	BYTE
928	80	52	FD	IONS	LOW	BYTE
929	80	51	FD	IONS	HIGH	BYTE
930	81	52	FD	IONS	LOW	BYTE
931	81	51	FD	IONS	HIGH	BYTE
932	82	52	FD	IONS	LOW	BYTE
933	82	51	FD	IONS	HIGH	BYTE
934	83	52	FD	IONS	LOW	BYTE
935	83	51	FD	IONS	HIGH	BYTE
936	84	52	FD	IONS	LOW	BYTE
937	84	51	FD	IONS	HIGH	BYTE
938	85	52	FD	IONS	LOW	BYTE
939	85	51	FD	IONS	HIGH	BYTE
940	86	52	FD	IONS	LOW	BYTE
941	86	51	FD	IONS	HIGH	BYTE
942	87	52	FD	IONS	LOW	BYTE
943	87	51	FD	IONS	HIGH	BYTE

February 6, 1979

944	88	52	FD	IONS	LOW BYTE
945	88	51	FD	IONS	HIGH BYTE
946	89	52	FD	IONS	LOW BYTE
947	89	51	FD	IONS	HIGH BYTE
948	90	52	FD	IONS	LOW BYTE
949	90	51	FD	IONS	HIGH BYTE
950	91	52	FD	IONS	LOW BYTE
951	91	51	FD	IONS	HIGH BYTE
952	92	52	FD	IONS	LOW BYTE
953	92	51	FD	IONS	HIGH BYTE
954	93	52	FD	IONS	LOW BYTE
955	93	51	FD	IONS	HIGH BYTE
956	94	52	FD	IONS	LOW BYTE
957	94	51	FD	IONS	HIGH BYTE
958	95	52	FD	IONS	LOW BYTE
959	95	51	FD	IONS	HIGH BYTE
960	96	52	FD	IONS	LOW BYTE
961	96	51	FD	IONS	HIGH BYTE
962	97	52	FD	IONS	LOW BYTE
963	97	51	FD	IONS	HIGH BYTE
964	98	52	FD	IONS	LOW BYTE
965	98	51	FD	IONS	HIGH BYTE
966	99	52	FD	IONS	LOW BYTE
967	99	51	FD	IONS	HIGH BYTE
968	100	52	FD	IONS	LOW BYTE
969	100	51	FD	IONS	HIGH BYTE
970	101	52	FD	IONS	LOW BYTE
971	101	51	FD	IONS	HIGH BYTE
972	102	52	FD	IONS	LOW BYTE
973	102	51	FD	IONS	HIGH BYTE
974	103	52	FD	IONS	LOW BYTE
975	103	51	FD	IONS	HIGH BYTE
976	104	52	FD	IONS	LOW BYTE
977	104	51	FD	IONS	HIGH BYTE
978	105	52	FD	IONS	LOW BYTE
979	105	51	FD	IONS	HIGH BYTE
980	106	52	FD	IONS	LOW BYTE
981	106	51	FD	IONS	HIGH BYTE
982	107	52	FD	IONS	LOW BYTE
983	107	51	FD	IONS	HIGH BYTE
984	108	52	FD	IONS	LOW BYTE
985	108	51	FD	IONS	HIGH BYTE
986	109	52	FD	IONS	LOW BYTE
987	109	51	FD	IONS	HIGH BYTE
988	110	52	FD	IONS	LOW BYTE
989	110	51	FD	IONS	HIGH BYTE
990	111	52	FD	IONS	LOW BYTE
991	111	51	FD	IONS	HIGH BYTE
992	112	52	FD	IONS	LOW BYTE
993	112	51	FD	IONS	HIGH BYTE
994	113	52	FD	IONS	LOW BYTE
995	113	51	FD	IONS	HIGH BYTE
996	114	52	FD	IONS	LOW BYTE
997	114	51	FD	IONS	HIGH BYTE
998	115	52	FD	IONS	LOW BYTE
999	115	51	FD	IONS	HIGH BYTE

February 6, 1979

1000	116	52	FD IONS LOW BYTE
1001	116	51	FD IONS HIGH BYTE
1002	117	52	FD IONS LOW BYTE
1003	117	51	FD IONS HIGH BYTE
1004	118	52	FD IONS LOW BYTE
1005	118	51	FD IONS HIGH BYTE
1006	119	52	FD IONS LOW BYTE
1007	119	51	FD IONS HIGH BYTE
1008	120	52	FD IONS LOW BYTE
1009	120	51	FD IONS HIGH BYTE
1010	121	52	FD IONS LOW BYTE
1011	121	51	FD IONS HIGH BYTE
1012	122	52	FD IONS LOW BYTE
1013	122	51	FD IONS HIGH BYTE
1014	123	52	FD IONS LOW BYTE
1015	123	51	FD IONS HIGH BYTE
1016	124	52	FD IONS LOW BYTE
1017	124	51	FD IONS HIGH BYTE
1018	125	52	FD IONS LOW BYTE
1019	125	51	FD IONS HIGH BYTE
1020	126	52	FD IONS LOW BYTE
1021	126	51	FD IONS HIGH BYTE
1022	127	52	FD IONS LOW BYTE
1023	127	51	FD IONS HIGH BYTE
1024	1	64	MAGNETOMETER X - COARSE
1025	3	64	MAGNETOMETER X - COARSE
1026	5	64	MAGNETOMETER X - COARSE
1027	7	64	MAGNETOMETER X - COARSE
1028	9	64	MAGNETOMETER X - COARSE
1029	11	64	MAGNETOMETER X - COARSE
1030	13	64	MAGNETOMETER X - COARSE
1031	15	64	MAGNETOMETER X - COARSE
1032	17	64	MAGNETOMETER X - COARSE
1033	19	64	MAGNETOMETER X - COARSE
1034	21	64	MAGNETOMETER X - COARSE
1035	23	64	MAGNETOMETER X - COARSE
1036	25	64	MAGNETOMETER X - COARSE
1037	27	64	MAGNETOMETER X - COARSE
1038	29	64	MAGNETOMETER X - COARSE
1039	31	64	MAGNETOMETER X - COARSE
1040	33	64	MAGNETOMETER X - COARSE
1041	35	64	MAGNETOMETER X - COARSE
1042	37	64	MAGNETOMETER X - COARSE
1043	39	64	MAGNETOMETER X - COARSE
1044	41	64	MAGNETOMETER X - COARSE
1045	43	64	MAGNETOMETER X - COARSE
1046	45	64	MAGNETOMETER X - COARSE
1047	47	64	MAGNETOMETER X - COARSE
1048	49	64	MAGNETOMETER X - COARSE
1049	51	64	MAGNETOMETER X - COARSE
1050	53	64	MAGNETOMETER X - COARSE
1051	55	64	MAGNETOMETER X - COARSE
1052	57	64	MAGNETOMETER X - COARSE
1053	59	64	MAGNETOMETER X - COARSE
1054	61	64	MAGNETOMETER X - COARSE

February 6, 1979

1055	63	64	MAGNETOMETER	X	-	COARSE
1056	65	64	MAGNETOMETER	X	-	COARSE
1057	67	64	MAGNETOMETER	X	-	COARSE
1058	69	64	MAGNETOMETER	X	-	COARSE
1059	71	64	MAGNETOMETER	X	-	COARSE
1060	73	64	MAGNETOMETER	X	-	COARSE
1061	75	64	MAGNETOMETER	X	-	COARSE
1062	77	64	MAGNETOMETER	X	-	COARSE
1063	79	64	MAGNETOMETER	X	-	COARSE
1064	81	64	MAGNETOMETER	X	-	COARSE
1065	83	64	MAGNETOMETER	X	-	COARSE
1066	85	64	MAGNETOMETER	X	-	COARSE
1067	87	64	MAGNETOMETER	X	-	COARSE
1068	89	64	MAGNETOMETER	X	-	COARSE
1069	91	64	MAGNETOMETER	X	-	COARSE
1070	93	64	MAGNETOMETER	X	-	COARSE
1071	95	64	MAGNETOMETER	X	-	COARSE
1072	97	64	MAGNETOMETER	X	-	COARSE
1073	99	64	MAGNETOMETER	X	-	COARSE
1074	101	64	MAGNETOMETER	X	-	COARSE
1075	103	64	MAGNETOMETER	X	-	COARSE
1076	105	64	MAGNETOMETER	X	-	COARSE
1077	107	64	MAGNETOMETER	X	-	COARSE
1078	109	64	MAGNETOMETER	X	-	COARSE
1079	111	64	MAGNETOMETER	X	-	COARSE
1080	113	64	MAGNETOMETER	X	-	COARSE
1081	115	64	MAGNETOMETER	X	-	COARSE
1082	117	64	MAGNETOMETER	X	-	COARSE
1083	119	64	MAGNETOMETER	X	-	COARSE
1084	121	64	MAGNETOMETER	X	-	COARSE
1085	123	64	MAGNETOMETER	X	-	COARSE
1086	125	64	MAGNETOMETER	X	-	COARSE
1087	127	64	MAGNETOMETER	X	-	COARSE
1088	1	65	MAGNETOMETER	X	-	FINE
1089	3	65	MAGNETOMETER	X	-	FINE
1090	5	65	MAGNETOMETER	X	-	FINE
1091	7	65	MAGNETOMETER	X	-	FINE
1092	9	65	MAGNETOMETER	X	-	FINE
1093	11	65	MAGNETOMETER	X	-	FINE
1094	13	65	MAGNETOMETER	X	-	FINE
1095	15	65	MAGNETOMETER	X	-	FINE
1096	17	65	MAGNETOMETER	X	-	FINE
1097	19	65	MAGNETOMETER	X	-	FINE
1098	21	65	MAGNETOMETER	X	-	FINE
1099	23	65	MAGNETOMETER	X	-	FINE
1100	25	65	MAGNETOMETER	X	-	FINE
1101	27	65	MAGNETOMETER	X	-	FINE
1102	29	65	MAGNETOMETER	X	-	FINE
1103	31	65	MAGNETOMETER	X	-	FINE
1104	33	65	MAGNETOMETER	X	-	FINE
1105	35	65	MAGNETOMETER	X	-	FINE
1106	37	65	MAGNETOMETER	X	-	FINE
1107	39	65	MAGNETOMETER	X	-	FINE
1108	41	65	MAGNETOMETER	X	-	FINE
1109	43	65	MAGNETOMETER	X	-	FINE
1110	45	65	MAGNETOMETER	X	-	FINE

February 6, 1979

1111	47	65	MAGNETOMETER	X	-	FINE
1112	49	65	MAGNETOMETER	X	-	FINE
1113	51	65	MAGNETOMETER	X	-	FINE
1114	53	65	MAGNETOMETER	X	-	FINE
1115	55	65	MAGNETOMETER	X	-	FINE
1116	57	65	MAGNETOMETER	X	-	FINE
1117	59	65	MAGNETOMETER	X	-	FINE
1118	61	65	MAGNETOMETER	X	-	FINE
1119	63	65	MAGNETOMETER	X	-	FINE
1120	65	65	MAGNETOMETER	X	-	FINE
1121	67	65	MAGNETOMETER	X	-	FINE
1122	69	65	MAGNETOMETER	X	-	FINE
1123	71	65	MAGNETOMETER	X	-	FINE
1124	73	65	MAGNETOMETER	X	-	FINE
1125	75	65	MAGNETOMETER	X	-	FINE
1126	77	65	MAGNETOMETER	X	-	FINE
1127	79	65	MAGNETOMETER	X	-	FINE
1128	81	65	MAGNETOMETER	X	-	FINE
1129	83	65	MAGNETOMETER	X	-	FINE
1130	85	65	MAGNETOMETER	X	-	FINE
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1144	113	55	MAGNETOMETER	X	-	FINE
1145	115	65	MAGNETOMETER	X	-	FINE
1146	117	65	MAGNETOMETER	X	-	FINE
1147	119	65	MAGNETOMETER	X	-	FINE
1148	121	65	MAGNETOMETER	X	-	FINE
1149	123	65	MAGNETOMETER	X	-	FINE
1150	125	65	MAGNETOMETER	X	-	FINE
1151	127	65	MAGNETOMETER	X	-	FINE
1152	1	66	MAGNETOMETER	Y	-	COARSE
1153	3	66	MAGNETOMETER	Y	-	COARSE
1154	5	66	MAGNETOMETER	Y	-	COARSE
1155	7	66	MAGNETOMETER	Y	-	COARSE
1156	9	66	MAGNETOMETER	Y	-	COARSE
1157	11	66	MAGNETOMETER	Y	-	COARSE
1158	13	66	MAGNETOMETER	Y	-	COARSE
1159	15	66	MAGNETOMETER	Y	-	COARSE
1160	17	66	MAGNETOMETER	Y	-	COARSE
1161	19	66	MAGNETOMETER	Y	-	COARSE
1162	21	66	MAGNETOMETER	Y	-	COARSE
1163	23	66	MAGNETOMETER	Y	-	COARSE
1164	25	66	MAGNETOMETER	Y	-	COARSE
1165	27	66	MAGNETOMETER	Y	-	COARSE
1166	29	66	MAGNETOMETER	Y	-	COARSE

February 6, 1979

1167	31	66	MAGNETOMETER	Y	-	COARSE
1168	33	66	MAGNETOMETER	Y	-	COARSE
1169	35	66	MAGNETOMETER	Y	-	COARSE
1170	37	66	MAGNETOMETER	Y	-	COARSE
1171	39	66	MAGNETOMETER	Y	-	COARSE
1172	41	66	MAGNETOMETER	Y	-	COARSE
1173	43	66	MAGNETOMETER	Y	-	COARSE
1174	45	66	MAGNETOMETER	Y	-	COARSE
1175	47	66	MAGNETOMETER	Y	-	COARSE
1176	49	66	MAGNETOMETER	Y	-	COARSE
1177	51	66	MAGNETOMETER	Y	-	COARSE
1178	53	66	MAGNETOMETER	Y	-	COARSE
1179	55	66	MAGNETOMETER	Y	-	COARSE
1180	57	66	MAGNETOMETER	Y	-	COARSE
1181	59	66	MAGNETOMETER	Y	-	COARSE
1182	61	66	MAGNETOMETER	Y	-	COARSE
1183	63	66	MAGNETOMETER	Y	-	COARSE
1184	65	66	MAGNETOMETER	Y	-	COARSE
1185	67	66	MAGNETOMETER	Y	-	COARSE
1186	69	66	MAGNETOMETER	Y	-	COARSE
1187	71	66	MAGNETOMETER	Y	-	COARSE
1188	73	66	MAGNETOMETER	Y	-	COARSE
1189	75	66	MAGNETOMETER	Y	-	COARSE
1190	77	66	MAGNETOMETER	Y	-	COARSE
1191	79	66	MAGNETOMETER	Y	-	COARSE
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1193	83	66	MAGNETOMETER	Y	-	COARSE
1194	85	66	MAGNETOMETER	Y	-	COARSE
1195	87	66	MAGNETOMETER	Y	-	COARSE
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1197	91	66	MAGNETOMETER	Y	-	COARSE
1198	93	66	MAGNETOMETER	Y	-	COARSE
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1202	101	66	MAGNETOMETER	Y	-	COARSE
1203	103	66	MAGNETOMETER	Y	-	COARSE
1204	105	66	MAGNETOMETER	Y	-	COARSE
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1206	109	66	MAGNETOMETER	Y	-	COARSE
1207	111	66	MAGNETOMETER	Y	-	COARSE
1208	113	66	MAGNETOMETER	Y	-	COARSE
1209	115	66	MAGNETOMETER	Y	-	COARSE
1210	117	66	MAGNETOMETER	Y	-	COARSE
1211	119	66	MAGNETOMETER	Y	-	COARSE
1212	121	66	MAGNETOMETER	Y	-	COARSE
1213	123	66	MAGNETOMETER	Y	-	COARSE
1214	125	66	MAGNETOMETER	Y	-	COARSE
1215	127	66	MAGNETOMETER	Y	-	COARSE
1216	1	67	MAGNETOMETER	Y	-	FINE
1217	3	67	MAGNETOMETER	Y	-	FINE
1218	5	67	MAGNETOMETER	Y	-	FINE
1219	7	67	MAGNETOMETER	Y	-	FINE
1220	9	67	MAGNETOMETER	Y	-	FINE
1221	11	67	MAGNETOMETER	Y	-	FINE
1222	13	67	MAGNETOMETER	Y	-	FINE

February 6, 1979

1223	15	67	MAGNETOMETER	Y	-	FINE
1224	17	67	MAGNETOMETER	Y	-	FINE
1225	19	67	MAGNETOMETER	Y	-	FINE
1226	21	67	MAGNETOMETER	Y	-	FINE
1227	23	67	MAGNETOMETER	Y	-	FINE
1228	25	67	MAGNETOMETER	Y	-	FINE
1229	27	67	MAGNETOMETER	Y	-	FINE
1230	29	67	MAGNETOMETER	Y	-	FINE
1231	31	67	MAGNETOMETER	Y	-	FINE
1232	33	67	MAGNETOMETER	Y	-	FINE
1233	35	67	MAGNETOMETER	Y	-	FINE
1234	37	67	MAGNETOMETER	Y	-	FINE
1235	39	67	MAGNETOMETER	Y	-	FINE
1236	41	67	MAGNETOMETER	Y	-	FINE
1237	43	67	MAGNETOMETER	Y	-	FINE
1238	45	67	MAGNETOMETER	Y	-	FINE
1239	47	67	MAGNETOMETER	Y	-	FINE
1240	49	67	MAGNETOMETER	Y	-	FINE
1241	51	67	MAGNETOMETER	Y	-	FINE
1242	53	67	MAGNETOMETER	Y	-	FINE
1243	55	67	MAGNETOMETER	Y	-	FINE
1244	57	67	MAGNETOMETER	Y	-	FINE
1245	59	67	MAGNETOMETER	Y	-	FINE
1246	61	67	MAGNETOMETER	Y	-	FINE
1247	63	67	MAGNETOMETER	Y	-	FINE
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1249	67	67	MAGNETOMETER	Y	-	FINE
1250	69	67	MAGNETOMETER	Y	-	FINE
1251	71	67	MAGNETOMETER	Y	-	FINE
1252	73	67	MAGNETOMETER	Y	-	FINE
1253	75	67	MAGNETOMETER	Y	-	FINE
1254	77	67	MAGNETOMETER	Y	-	FINE
1255	79	67	MAGNETOMETER	Y	-	FINE
1256	81	67	MAGNETOMETER	Y	-	FINE
1257	83	67	MAGNETOMETER	Y	-	FINE
1258	85	67	MAGNETOMETER	Y	-	FINE
1259	87	67	MAGNETOMETER	Y	-	FINE
1260	89	67	MAGNETOMETER	Y	-	FINE
1261	91	67	MAGNETOMETER	Y	-	FINE
1262	93	67	MAGNETOMETER	Y	-	FINE
1263	95	67	MAGNETOMETER	Y	-	FINE
1264	97	67	MAGNETOMETER	Y	-	FINE
1265	99	67	MAGNETOMETER	Y	-	FINE
1266	101	67	MAGNETOMETER	Y	-	FINE
1267	103	67	MAGNETOMETER	Y	-	FINE
1268	105	67	MAGNETOMETER	Y	-	FINE
1269	107	67	MAGNETOMETER	Y	-	FINE
1270	109	67	MAGNETOMETER	Y	-	FINE
1271	111	67	MAGNETOMETER	Y	-	FINE
1272	113	67	MAGNETOMETER	Y	-	FINE
1273	115	67	MAGNETOMETER	Y	-	FINE
1274	117	67	MAGNETOMETER	Y	-	FINE
1275	119	67	MAGNETOMETER	Y	-	FINE
1276	121	67	MAGNETOMETER	Y	-	FINE
1277	123	67	MAGNETOMETER	Y	-	FINE
1278	125	67	MAGNETOMETER	Y	-	FINE
1279	127	67	MAGNETOMETER	Y	-	FINE

February 6, 1979

1280	1	68	MAGNETOMETER	Z	-	COARSE
1281	3	68	MAGNETOMETER	Z	-	COARSE
1282	5	68	MAGNETOMETER	Z	-	COARSE
1283	7	68	MAGNETOMETER	Z	-	COARSE
1284	9	68	MAGNETOMETER	Z	-	COARSE
1285	11	68	MAGNETOMETER	Z	-	COARSE
1286	13	68	MAGNETOMETER	Z	-	COARSE
1287	15	68	MAGNETOMETER	Z	-	COARSE
1288	17	68	MAGNETOMETER	Z	-	COARSE
1289	19	68	MAGNETOMETER	Z	-	COARSE
1290	21	68	MAGNETOMETER	Z	-	COARSE
1291	23	68	MAGNETOMETER	Z	-	COARSE
1292	25	68	MAGNETOMETER	Z	-	COARSE
1293	27	68	MAGNETOMETER	Z	-	COARSE
1294	29	68	MAGNETOMETER	Z	-	COARSE
1295	31	68	MAGNETOMETER	Z	-	COARSE
1296	33	68	MAGNETOMETER	Z	-	COARSE
1297	35	68	MAGNETOMETER	Z	-	COARSE
1298	37	68	MAGNETOMETER	Z	-	COARSE
1299	39	68	MAGNETOMETER	Z	-	COARSE
1300	41	68	MAGNETOMETER	Z	-	COARSE
1301	43	68	MAGNETOMETER	Z	-	COARSE
1302	45	68	MAGNETOMETER	Z	-	COARSE
1303	47	68	MAGNETOMETER	Z	-	COARSE
1304	49	68	MAGNETOMETER	Z	-	COARSE
1305	51	68	MAGNETOMETER	Z	-	COARSE
1306	53	68	MAGNETOMETER	Z	-	COARSE
1307	55	68	MAGNETOMETER	Z	-	COARSE
1308	57	68	MAGNETOMETER	Z	-	COARSE
1309	59	68	MAGNETOMETER	Z	-	COARSE
1310	61	68	MAGNETOMETER	Z	-	COARSE
1311	63	68	MAGNETOMETER	Z	-	COARSE
1312	65	68	MAGNETOMETER	Z	-	COARSE
1313	67	68	MAGNETOMETER	Z	-	COARSE
1314	69	68	MAGNETOMETER	Z	-	COARSE
1315	71	68	MAGNETOMETER	Z	-	COARSE
1316	73	68	MAGNETOMETER	Z	-	COARSE
1317	75	68	MAGNETOMETER	Z	-	COARSE
1318	77	68	MAGNETOMETER	Z	-	COARSE
1319	79	68	MAGNETOMETER	Z	-	COARSE
1320	81	68	MAGNETOMETER	Z	-	COARSE
1321	83	68	MAGNETOMETER	Z	-	COARSE
1322	85	68	MAGNETOMETER	Z	-	COARSE
1323	87	68	MAGNETOMETER	Z	-	COARSE
1324	89	68	MAGNETOMETER	Z	-	COARSE
1325	91	68	MAGNETOMETER	Z	-	COARSE
1326	93	68	MAGNETOMETER	Z	-	COARSE
1327	95	68	MAGNETOMETER	Z	-	COARSE
1328	97	68	MAGNETOMETER	Z	-	COARSE
1329	99	68	MAGNETOMETER	Z	-	COARSE
1330	101	68	MAGNETOMETER	Z	-	COARSE
1331	103	68	MAGNETOMETER	Z	-	COARSE
1332	105	68	MAGNETOMETER	Z	-	COARSE
1333	107	68	MAGNETOMETER	Z	-	COARSE
1334	109	68	MAGNETOMETER	Z	-	COARSE
1335	111	68	MAGNETOMETER	Z	-	COARSE

February 6, 1979

1336	113	68 MAGNETOMETER Z - COARSE
1337	115	68 MAGNETOMETER Z - COARSE
1338	117	68 MAGNETOMETER Z - COARSE
1339	119	68 MAGNETOMETER Z - COARSE
1340	121	68 MAGNETOMETER Z - COARSE
1341	123	68 MAGNETOMETER Z - COARSE
1342	125	68 MAGNETOMETER Z - COARSE
1343	127	68 MAGNETOMETER Z - COARSE
1344	1	69 MAGNETOMETER Z - FINE
1345	3	69 MAGNETOMETER Z - FINE
1346	5	69 MAGNETOMETER Z - FINE
1347	7	69 MAGNETOMETER Z - FINE
1348	9	69 MAGNETOMETER Z - FINE
1349	11	69 MAGNETOMETER Z - FINE
1350	13	69 MAGNETOMETER Z - FINE
1351	15	69 MAGNETOMETER Z - FINE
1352	17	69 MAGNETOMETER Z - FINE
1353	19	69 MAGNETOMETER Z - FINE
1354	21	69 MAGNETOMETER Z - FINE
1355	23	69 MAGNETOMETER Z - FINE
1356	25	69 MAGNETOMETER Z - FINE
1357	27	69 MAGNETOMETER Z - FINE
1358	29	69 MAGNETOMETER Z - FINE
1359	31	69 MAGNETOMETER Z - FINE
1360	33	69 MAGNETOMETER Z - FINE
1361	35	69 MAGNETOMETER Z - FINE
1362	37	69 MAGNETOMETER Z - FINE
1363	39	69 MAGNETOMETER Z - FINE
1364	41	69 MAGNETOMETER Z - FINE
1365	43	69 MAGNETOMETER Z - FINE
1366	45	69 MAGNETOMETER Z - FINE
1367	47	69 MAGNETOMETER Z - FINE
1368	49	69 MAGNETOMETER Z - FINE
1369	51	69 MAGNETOMETER Z - FINE
1370	53	69 MAGNETOMETER Z - FINE
1371	55	69 MAGNETOMETER Z - FINE
1372	57	69 MAGNETOMETER Z - FINE
1373	59	69 MAGNETOMETER Z - FINE
1374	61	69 MAGNETOMETER Z - FINE
1375	63	69 MAGNETOMETER Z - FINE
1376	65	69 MAGNETOMETER Z - FINE
1377	67	69 MAGNETOMETER Z - FINE
1378	69	69 MAGNETOMETER Z - FINE
1379	71	69 MAGNETOMETER Z - FINE
1380	73	69 MAGNETOMETER Z - FINE
1381	75	69 MAGNETOMETER Z - FINE
1382	77	69 MAGNETOMETER Z - FINE
1383	79	69 MAGNETOMETER Z - FINE
1384	81	69 MAGNETOMETER Z - FINE
1385	83	69 MAGNETOMETER Z - FINE
1386	85	69 MAGNETOMETER Z - FINE
1387	87	69 MAGNETOMETER Z - FINE
1388	89	69 MAGNETOMETER Z - FINE
1389	91	69 MAGNETOMETER Z - FINE
1390	93	69 MAGNETOMETER Z - FINE
1391	95	69 MAGNETOMETER Z - FINE

February 6, 1979

1392	97	69	MAGNETOMETER	Z - FINE
1393	99	69	MAGNETOMETER	Z - FINE
1394	101	69	MAGNETOMETER	Z - FINE
1395	103	69	MAGNETOMETER	Z - FINE
1396	105	69	MAGNETOMETER	Z - FINE
1397	107	69	MAGNETOMETER	Z - FINE
1398	109	69	MAGNETOMETER	Z - FINE
1399	111	69	MAGNETOMETER	Z - FINE
1400	113	69	MAGNETOMETER	Z - FINE
1401	115	69	MAGNETOMETER	Z - FINE
1402	117	69	MAGNETOMETER	Z - FINE
1403	119	69	MAGNETOMETER	Z - FINE
1404	121	69	MAGNETOMETER	Z - FINE
1405	123	69	MAGNETOMETER	Z - FINE
1406	125	69	MAGNETOMETER	Z - FINE
1407	127	69	MAGNETOMETER	Z - FINE
1408	1	73	MAGNETOMETER	DIRECTION X
1409	9	73	MAGNETOMETER	DIRECTION X
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1411	25	73	MAGNETOMETER	DIRECTION X
1412	33	73	MAGNETOMETER	DIRECTION X
1413	41	73	MAGNETOMETER	DIRECTION X
1414	49	73	MAGNETOMETER	DIRECTION X
1415	57	73	MAGNETOMETER	DIRECTION X
1416	65	73	MAGNETOMETER	DIRECTION X
1417	73	73	MAGNETOMETER	DIRECTION X
1418	81	73	MAGNETOMETER	DIRECTION X
1419	89	73	MAGNETOMETER	DIRECTION X
1420	97	73	MAGNETOMETER	DIRECTION X
1421	105	73	MAGNETOMETER	DIRECTION X
1422	113	73	MAGNETOMETER	DIRECTION X
1423	121	73	MAGNETOMETER	DIRECTION X
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1425	9	74	MAGNETOMETER	DIRECTION Y
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1427	25	74	MAGNETOMETER	DIRECTION Y
1428	33	74	MAGNETOMETER	DIRECTION Y
1429	41	74	MAGNETOMETER	DIRECTION Y
1430	49	74	MAGNETOMETER	DIRECTION Y
1431	57	74	MAGNETOMETER	DIRECTION Y
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1433	73	74	MAGNETOMETER	DIRECTION Y
1434	81	74	MAGNETOMETER	DIRECTION Y
1435	89	74	MAGNETOMETER	DIRECTION Y
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1438	113	74	MAGNETOMETER	DIRECTION Y
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1442	17	75	MAGNETOMETER	DIRECTION Z
1443	25	75	MAGNETOMETER	DIRECTION Z
1444	33	75	MAGNETOMETER	DIRECTION Z
1445	41	75	MAGNETOMETER	DIRECTION Z
1446	49	75	MAGNETOMETER	DIRECTION Z
1447	57	75	MAGNETOMETER	DIRECTION Z

February 6, 1979

1448	65	75	MAGNETOMETER DIRECTION Z
1449	73	75	MAGNETOMETER DIRECTION Z
1450	81	75	MAGNETOMETER DIRECTION Z
1451	89	75	MAGNETOMETER DIRECTION Z
1452	97	75	MAGNETOMETER DIRECTION Z
1453	105	75	MAGNETOMETER DIRECTION Z
1454	113	75	MAGNETOMETER DIRECTION Z
1455	121	75	MAGNETOMETER DIRECTION Z
1456	107	102	+DVNS
1457	108	102	-DVNS
1458	109	102	+DVEW
1459	110	102	-DVEW
1460	111	-102	+DVFD
1461	112	102	-DVFD
1462	113	102	SVNS
1463	114	102	SVEW
1464	115	-102	SVFD
1465	116	102	TNS
1466	117	-102	TEW
1467	118	102	TMB
1468	119	102	TPCU
1469	120	102	NS POS
1470	121	102	EW POS
1471	122	102	PCU MONITOR
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1486	116	110	NS ANALOG POSITION
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1499	93	110	EW ANALOG POSITION
1500	101	110	EW ANALOG POSITION
1501	109	110	EW ANALOG POSITION
1502	117	110	EW ANALOG POSITION
1503	125	110	EW ANALOG POSITION

February 6, 1979

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1506	8	35	MSB--<0><0><0><0><PV1B1><PV1B2><PV1B3><PV1B4>--LSB
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1508	16	35	MSB--<0><0><0><0><PV1B1><PV1B2><PV1B3><PV1B4>--LSB
1509	16	36	PV1
1510	24	35	MSB--<0><0><0><0><PV1B1><PV1B2><PV1B3><PV1B4>--LSB
1511	24	36	PV1
1512	32	35	MSB--<0><0><0><0><PV1B1><PV1B2><PV1B3><PV1B4>--LSB
1513	32	36	PV1
1514	40	35	MSB--<0><0><0><0><PV1B1><PV1B2><PV1B3><PV1B4>--LSB
1515	40	36	PV1
1516	48	35	MSB--<0><0><0><0><PV1B1><PV1B2><PV1B3><PV1B4>--LSB
1517	48	36	PV1
1518	56	35	MSB--<0><0><0><0><PV1B1><PV1B2><PV1B3><PV1B4>--LSB
1519	56	36	PV1
1520	64	35	MSB--<0><0><0><0><PV1B1><PV1B2><PV1B3><PV1B4>--LSB
1521	64	36	PV1
1522	72	35	MSB--<0><0><0><0><PV1B1><PV1B2><PV1B3><PV1B4>--LSB
1523	72	36	PV1
1524	80	35	MSB--<0><0><0><0><PV1B1><PV1B2><PV1B3><PV1B4>--LSB
1525	80	36	PV1
1526	88	35	MSB--<0><0><0><0><PV1B1><PV1B2><PV1B3><PV1B4>--LSB
1527	88	36	PV1
1528	96	35	MSB--<0><0><0><0><PV1B1><PV1B2><PV1B3><PV1B4>--LSB
1529	96	36	PV1
1530	104	35	MSB--<0><0><0><0><PV1B1><PV1B2><PV1B3><PV1B4>--LSB
1531	104	36	PV1
1532	112	35	MSB--<0><0><0><0><PV1B1><PV1B2><PV1B3><PV1B4>--LSB
1533	112	36	PV1
1534	120	35	MSB--<0><0><0><0><PV1B1><PV1B2><PV1B3><PV1B4>--LSB
1535	120	36	PV1
1536	0	5	MSB--<0><0><0><0><PV2B1><PV2B2><PV2B3><PV2B4>--LSB
1537	0	6	PV2
1538	8	5	MSB--<0><0><0><0><PV2B1><PV2B2><PV2B3><PV2B4>--LSB
1539	8	6	PV2
1540	16	5	MSB--<0><0><0><0><PV2B1><PV2B2><PV2B3><PV2B4>--LSB
1541	16	6	PV2
1542	24	5	MSB--<0><0><0><0><PV2B1><PV2B2><PV2B3><PV2B4>--LSB
1543	24	6	PV2
1544	32	5	MSB--<0><0><0><0><PV2B1><PV2B2><PV2B3><PV2B4>--LSB
1545	32	6	PV2
1546	40	5	MSB--<0><0><0><0><PV2B1><PV2B2><PV2B3><PV2B4>--LSB
1547	40	6	PV2
1548	48	5	MSB--<0><0><0><0><PV2B1><PV2B2><PV2B3><PV2B4>--LSB
1549	48	6	PV2
1550	56	5	MSB--<0><0><0><0><PV2B1><PV2B2><PV2B3><PV2B4>--LSB
1551	56	6	PV2
1552	64	5	MSB--<0><0><0><0><PV2B1><PV2B2><PV2B3><PV2B4>--LSB
1553	64	6	PV2
1554	72	5	MSB--<0><0><0><0><PV2B1><PV2B2><PV2B3><PV2B4>--LSB
1555	72	6	PV2
1556	80	5	MSB--<0><0><0><0><PV2B1><PV2B2><PV2B3><PV2B4>--LSB
1557	80	6	PV2
1558	88	5	MSB--<0><0><0><0><PV2B1><PV2B2><PV2B3><PV2B4>--LSB
1559	88	6	PV2

February 6, 1979

1560	96	5	MSB--<0><0><0><0><PV2B1><PV2B2><PV2B3><PV2B4>--LSB
1561	96	6	PV2
1562	104	5	MSB--<0><0><0><0><PV2B1><PV2B2><PV2B3><PV2B4>--LSB
1563	104	6	PV2
1564	112	5	MSB--<0><0><0><0><PV2B1><PV2B2><PV2B3><PV2B4>--LSB
1565	112	6	PV2
1566	120	5	MSB--<0><0><0><0><PV2B1><PV2B2><PV2B3><PV2B4>--LSB
1567	120	6	PV2
1568	0	103	MSB--<BCF1><BCF2><BCF3><BCF4><BCF5><BON><BDCF><BFF1>--LSB
1569	16	103	MSB--<BCF1><BCF2><BCF3><BCF4><BCF5><BON><BDCF><BFF1>--LSB
1570	32	103	MSB--<BCF1><BCF2><BCF3><BCF4><BCF5><BON><BDCF><BFF1>--LSB
1571	48	103	MSB--<BCF1><BCF2><BCF3><BCF4><BCF5><BON><BDCF><BFF1>--LSB
1572	64	103	MSB--<BCF1><BCF2><BCF3><BCF4><BCF5><BON><BDCF><BFF1>--LSB
1573	80	103	MSB--<BCF1><BCF2><BCF3><BCF4><BCF5><BON><BDCF><BFF1>--LSB
1574	96	103	MSB--<BCF1><BCF2><BCF3><BCF4><BCF5><BON><BDCF><BFF1>--LSB
1575	112	103	MSB--<BCF1><BCF2><BCF3><BCF4><BCF5><BON><BDCF><BFF1>--LSB
1576	1	103	MSB--<BFF2><BEF1><BEF2><BEF3><BEF4><GCDF><BCSF><NBPF>--LSB
1577	17	103	MSB--<BFF2><BEF1><BEF2><BEF3><BEF4><GCDF><BCSF><NBPF>--LSB
1578	33	103	MSB--<BFF2><BEF1><BEF2><BEF3><BEF4><GCDF><BCSF><NBPF>--LSB
1579	49	103	MSB--<BFF2><BEF1><BEF2><BEF3><BEF4><GCDF><BCSF><NBPF>--LSB
1580	65	103	MSB--<BFF2><BEF1><BEF2><BEF3><BEF4><GCDF><BCSF><NBPF>--LSB
1581	81	103	MSB--<BFF2><BEF1><BEF2><BEF3><BEF4><GCDF><BCSF><NBPF>--LSB
1582	97	103	MSB--<BFF2><BEF1><BEF2><BEF3><BEF4><GCDF><BCSF><NBPF>--LSB
1583	113	103	MSB--<BFF2><BEF1><BEF2><BEF3><BEF4><GCDF><BCSF><NBPF>--LSB
1584	0	21	BEAM CURRENT HI
1585	8	21	BEAM CURRENT HI
1586	16	21	BEAM CURRENT HI
1587	24	21	BEAM CURRENT HI
1588	32	21	BEAM CURRENT HI
1589	40	21	BEAM CURRENT HI
1590	48	21	BEAM CURRENT HI
1591	56	21	BEAM CURRENT HI
1592	64	21	BEAM CURRENT HI
1593	72	21	BEAM CURRENT HI
1594	80	21	BEAM CURRENT HI
1595	88	21	BEAM CURRENT HI
1596	96	21	BEAM CURRENT HI
1597	104	21	BEAM CURRENT HI
1598	112	21	BEAM CURRENT HI
1599	120	21	BEAM CURRENT HI
1600	0	22	BEAM CURRENT MONITOR
1601	8	22	BEAM CURRENT MONITOR
1602	16	22	BEAM CURRENT MONITOR
1603	24	22	BEAM CURRENT MONITOR
1604	32	22	BEAM CURRENT MONITOR
1605	40	22	BEAM CURRENT MONITOR
1606	48	22	BEAM CURRENT MONITOR
1607	56	22	BEAM CURRENT MONITOR
1608	64	22	BEAM CURRENT MONITOR
1609	72	22	BEAM CURRENT MONITOR
1610	80	22	BEAM CURRENT MONITOR
1611	88	22	BEAM CURRENT MONITOR
1612	96	22	BEAM CURRENT MONITOR
1613	104	22	BEAM CURRENT MONITOR
1614	112	22	BEAM CURRENT MONITOR
1615	120	22	BEAM CURRENT MONITOR

February 6, 1979

1616	0	23 NEUTRALIZER EMISSION
1617	8	23 NEUTRALIZER EMISSION
1618	16	23 NEUTRALIZER EMISSION
1619	24	23 NEUTRALIZER EMISSION
1620	32	23 NEUTRALIZER EMISSION
1621	40	23 NEUTRALIZER EMISSION
1622	48	23 NEUTRALIZER EMISSION
1623	56	23 NEUTRALIZER EMISSION
1624	64	23 NEUTRALIZER EMISSION
1625	72	23 NEUTRALIZER EMISSION
1626	80	23 NEUTRALIZER EMISSION
1627	88	23 NEUTRALIZER EMISSION
1628	96	23 NEUTRALIZER EMISSION
1629	104	23 NEUTRALIZER EMISSION
1630	112	23 NEUTRALIZER EMISSION
1631	120	23 NEUTRALIZER EMISSION
1632	0	24 SPIBS NEUT CURRENT MONITOR
1633	8	24 SPIBS NEUT CURRENT MONITOR
1634	16	24 SPIBS NEUT CURRENT MONITOR
1635	24	24 SPIBS NEUT CURRENT MONITOR
1636	32	24 SPIBS NEUT CURRENT MONITOR
1637	40	24 SPIBS NEUT CURRENT MONITOR
1638	48	24 SPIBS NEUT CURRENT MONITOR
1639	56	24 SPIBS NEUT CURRENT MONITOR
1640	64	24 SPIBS NEUT CURRENT MONITOR
1641	72	24 SPIBS NEUT CURRENT MONITOR
1642	80	24 SPIBS NEUT CURRENT MONITOR
1643	88	24 SPIBS NEUT CURRENT MONITOR
1644	96	24 SPIBS NEUT CURRENT MONITOR
1645	104	24 SPIBS NEUT CURRENT MONITOR
1646	112	24 SPIBS NEUT CURRENT MONITOR
1647	120	24 SPIBS NEUT CURRENT MONITOR
1648	4	112 DISCHARGE CURRENT
1649	20	112 DISCHARGE CURRENT
1650	36	112 DISCHARGE CURRENT
1651	52	112 DISCHARGE CURRENT
1652	68	112 DISCHARGE CURRENT
1653	84	112 DISCHARGE CURRENT
1654	100	112 DISCHARGE CURRENT
1655	116	112 DISCHARGE CURRENT
1656	55	102 HIGH VOLTAGE MONITOR
1657	56	102 VOLTAGE MONITOR 1
1658	57	102 VOLTAGE MONITOR 2
1659	60	102 BEAM VOLTAGE MONITOR
1660	63	102 KEEPER CURRENT MONITOR
1661	62	102 KEEPER HIGH VOLTAGE MONITOR
1662	71	102 ACCELERATOR CURRENT MONITOR
1663	72	102 DECELERATOR CURRENT MONITOR
1664	73	102 NEUTRALIZER HTR CURRENT MONITOR
1665	74	102 NEUTRALIZER DIAS VOLTAGE MONITOR
1666	12	103 NON CRITICAL BUS VOLTAGE
1667	28	103 NON CRITICAL BUS VOLTAGE
1668	44	103 NON CRITICAL BUS VOLTAGE
1669	60	103 NON CRITICAL BUS VOLTAGE
1670	76	103 NON CRITICAL BUS VOLTAGE
1671	92	103 NON CRITICAL BUS VOLTAGE

February 6, 1979

1672	108	103	NON CRITICAL BUS VOLTAGE
1673	124	103	NON CRITICAL BUS VOLTAGE
1674	1	108	NON CRITICAL BUS CURRENT #1
1675	17	108	NON CRITICAL BUS CURRENT #1
1676	33	108	NON CRITICAL BUS CURRENT #1
1677	49	108	NON CRITICAL BUS CURRENT #1
1678	65	108	NON CRITICAL BUS CURRENT #1
1679	81	108	NON CRITICAL BUS CURRENT #1
1680	97	108	NON CRITICAL BUS CURRENT #1
1681	113	108	NON CRITICAL BUS CURRENT #1
1682	2	108	NON CRITICAL BUS CURRENT #2
1683	18	108	NON CRITICAL BUS CURRENT #2
1684	34	108	NON CRITICAL BUS CURRENT #2
1685	50	108	NON CRITICAL BUS CURRENT #2
1686	66	108	NON CRITICAL BUS CURRENT #2
1687	82	108	NON CRITICAL BUS CURRENT #2
1688	98	108	NON CRITICAL BUS CURRENT #2
1689	114	108	NON CRITICAL BUS CURRENT #2
1690	43	42	SOLAR ARRAY TEMP #1
1691	44	42	SOLAR ARRAY TEMP #2
1692	56	42	SOLAR ARRAY TEMP #3
1693	46	42	SOLAR ARRAY TEMP #4
1694	2	109	SOLAR ARRAY CURRENT #1
1695	10	109	SOLAR ARRAY CURRENT #1
1696	18	109	SOLAR ARRAY CURRENT #1
1697	26	109	SOLAR ARRAY CURRENT #1
1698	34	109	SOLAR ARRAY CURRENT #1
1699	42	109	SOLAR ARRAY CURRENT #1
1700	50	109	SOLAR ARRAY CURRENT #1
1701	58	109	SOLAR ARRAY CURRENT #1
1702	66	109	SOLAR ARRAY CURRENT #1
1703	74	109	SOLAR ARRAY CURRENT #1
1704	82	109	SOLAR ARRAY CURRENT #1
1705	90	109	SOLAR ARRAY CURRENT #1
1706	98	109	SOLAR ARRAY CURRENT #1
1707	106	109	SOLAR ARRAY CURRENT #1
1708	114	109	SOLAR ARRAY CURRENT #1
1709	122	109	SOLAR ARRAY CURRENT #1
1710	2	110	SOLAR ARRAY CURRENT #2
1711	10	110	SOLAR ARRAY CURRENT #2
1712	18	110	SOLAR ARRAY CURRENT #2
1713	26	110	SOLAR ARRAY CURRENT #2
1714	34	110	SOLAR ARRAY CURRENT #2
1715	42	110	SOLAR ARRAY CURRENT #2
1716	50	110	SOLAR ARRAY CURRENT #2
1717	58	110	SOLAR ARRAY CURRENT #2
1718	66	110	SOLAR ARRAY CURRENT #2
1719	74	110	SOLAR ARRAY CURRENT #2
1720	82	110	SOLAR ARRAY CURRENT #2
1721	90	110	SOLAR ARRAY CURRENT #2
1722	98	110	SOLAR ARRAY CURRENT #2
1723	106	110	SOLAR ARRAY CURRENT #2
1724	114	110	SOLAR ARRAY CURRENT #2
1725	122	110	SOLAR ARRAY CURRENT #2
1726	47	42	SHUNT REGULATOR TEMP
1727	48	42	PCU TEMP 1

February 6, 1979

1728	0	106	STATUS DCC
1729	2	106	STATUS DCC
1730	4	106	STATUS DCC
1731	6	106	STATUS DCC
1732	8	106	STATUS DCC
1733	10	106	STATUS DCC
1734	12	106	STATUS DCC
1735	14	106	STATUS DCC
1736	16	106	STATUS DCC
1737	18	106	STATUS DCC
1738	20	106	STATUS DCC
1739	22	106	STATUS DCC
1740	24	106	STATUS DCC
1741	26	106	STATUS DCC
1742	28	106	STATUS DCC
1743	30	106	STATUS DCC
1744	32	106	STATUS DCC
1745	34	106	STATUS DCC
1746	36	106	STATUS DCC
1747	38	106	STATUS DCC
1748	40	106	STATUS DCC
1749	42	106	STATUS DCC
1750	44	106	STATUS DCC
1751	46	106	STATUS DCC
1752	48	106	STATUS DCC
1753	50	106	STATUS DCC
1754	52	106	STATUS DCC
1755	54	106	STATUS DCC
1756	56	106	STATUS DCC
1757	58	106	STATUS DCC
1758	60	106	STATUS DCC
1759	62	106	STATUS DCC
1760	64	106	STATUS DCC
1761	66	106	STATUS DCC
1762	68	106	STATUS DCC
1763	70	106	STATUS DCC
1764	72	106	STATUS DCC
1765	74	106	STATUS DCC
1766	76	106	STATUS DCC
1767	78	106	STATUS DCC
1768	80	106	STATUS DCC
1769	82	106	STATUS DCC
1770	84	106	STATUS DCC
1771	86	106	STATUS DCC
1772	88	106	STATUS DCC
1773	90	106	STATUS DCC
1774	92	106	STATUS DCC
1775	94	106	STATUS DCC
1776	96	106	STATUS DCC
1777	98	106	STATUS DCC
1778	100	106	STATUS DCC
1779	102	106	STATUS DCC
1780	104	106	STATUS DCC
1781	106	106	STATUS DCC
1782	108	106	STATUS DCC
1783	110	106	STATUS DCC

February 6, 1979

1784	112	106	STATUS	DCC
1785	114	106	STATUS	DCC
1786	116	106	STATUS	DCC
1787	118	106	STATUS	DCC
1788	120	106	STATUS	DCC
1789	122	106	STATUS	DCC
1790	124	106	STATUS	DCC
1791	126	106	STATUS	DCC
1792	1	106	STATUS	NSP
1793	5	106	STATUS	MSB
1794	9	106	STATUS	NSP
1795	13	106	STATUS	MSB
1796	17	106	STATUS	NSP
1797	21	106	STATUS	MSB
1798	25	106	STATUS	NSP
1799	29	106	STATUS	MSB
1800	33	106	STATUS	NSP
1801	37	106	STATUS	MSB
1802	41	106	STATUS	NSP
1803	45	106	STATUS	MSB
1804	49	106	STATUS	NSP
1805	53	106	STATUS	MSB
1806	57	106	STATUS	NSP
1807	61	106	STATUS	MSB
1808	65	106	STATUS	NSP
1809	69	106	STATUS	MSB
1810	73	106	STATUS	NSP
1811	77	106	STATUS	MSB
1812	81	106	STATUS	NSP
1813	85	106	STATUS	MSB
1814	89	106	STATUS	NSP
1815	93	106	STATUS	MSB
1816	97	106	STATUS	NSP
1817	101	106	STATUS	MSB
1818	105	106	STATUS	NSP
1819	109	106	STATUS	MSB
1820	113	106	STATUS	NSP
1821	117	106	STATUS	MSB
1822	121	106	STATUS	NSP
1823	125	106	STATUS	MSB
1824	3	106	STATUS	EMP
1825	5	106	STATUS	MSB
1826	11	106	STATUS	EMP
1827	13	106	STATUS	MSB
1828	19	106	STATUS	EMP
1829	21	106	STATUS	MSB
1830	27	106	STATUS	EMP
1831	29	106	STATUS	MSB
1832	35	106	STATUS	EMP
1833	37	106	STATUS	MSB
1834	43	106	STATUS	EMP
1835	45	106	STATUS	MSB
1836	51	106	STATUS	EMP
1837	53	106	STATUS	MSB
1838	59	106	STATUS	EMP

NOTE: Odd numbered lines 1793-1856 have been slightly scrambled on our tape. These lines should be filled with:
 MSB--<CCWEW>--<EWPB11>--<EWPB10>--<EWPB9>--<CWNS>--<NSPB11>--<NSPB10>--<NSPB9>--LSB

February 6, 1979

1839	61	106	STATUS	MSB--<0><0><0><0><CCNEW><EWPB11><EWPB10><EWPB9>--LSB
1840	67	106	STATUS	EWP
1841	69	106	STATUS	MSB--<0><0><0><0><CCNEW><EWPB11><EWPB10><EWPB9>--LSB
1842	75	106	STATUS	EWP
1843	77	106	STATUS	MSB--<0><0><0><0><CCNEW><EWPB11><EWPB10><EWPB9>--LSB
1844	83	106	STATUS	EWP
1845	85	106	STATUS	MSB--<0><0><0><0><CCNEW><EWPB11><EWPB10><EWPB9>--LSB
1846	91	106	STATUS	EWP
1847	93	106	STATUS	MSB--<0><0><0><0><CCNEW><EWPB11><EWPB10><EWPB9>--LSB
1848	99	106	STATUS	EWP
1849	101	106	STATUS	MSB--<0><0><0><0><CCNEW><EWPB11><EWPB10><EWPB9>--LSB
1850	107	106	STATUS	EWP
1851	109	106	STATUS	MSB--<0><0><0><0><CCNEW><EWPB11><EWPB10><EWPB9>--LSB
1852	115	106	STATUS	EWP
1853	117	106	STATUS	MSB--<0><0><0><0><CCNEW><EWPB11><EWPB10><EWPB9>--LSB
1854	123	106	STATUS	EWP
1855	125	106	STATUS	MSB--<0><0><0><0><CCNEW><EWPB11><EWPB10><EWPB9>--LSB
1856	7	106	STATUS	NSLL
1857	15	106	STATUS	NSUL
1858	23	106	STATUS	EWLL
1859	31	106	STATUS	EWUL
1860	39	106	STATUS	NSPS
1861	47	106	STATUS	EWFS
1862	55	106	STATUS	DT
1863	63	106	STATUS	DN
1864	71	106	STATUS	ID1
1865	79	106	STATUS	DSS
1866	87	106	STATUS	AG
1867	95	106	STATUS	MP
1868	103	106	STATUS	LATCHING COMMANDS 1-7
1869	111	106	STATUS	LATCHING COMMANDS 8-14
1870	119	106	STATUS	MAGNITUDE COMMANDS 1-8
1871	127	106	STATUS	MAGNITUDE COMMANDS 9-16
1872	3	109	ELECTRIC	CHANNEL 1
1873	11	109	ELECTRIC	CHANNEL 1
1874	19	109	ELECTRIC	CHANNEL 1
1875	27	109	ELECTRIC	CHANNEL 1
1876	35	109	ELECTRIC	CHANNEL 1
1877	43	109	ELECTRIC	CHANNEL 1
1878	51	109	ELECTRIC	CHANNEL 1
1879	59	109	ELECTRIC	CHANNEL 1
1880	67	109	ELECTRIC	CHANNEL 1
1881	75	109	ELECTRIC	CHANNEL 1
1882	83	109	ELECTRIC	CHANNEL 1
1883	91	109	ELECTRIC	CHANNEL 1
1884	99	109	ELECTRIC	CHANNEL 1
1885	107	109	ELECTRIC	CHANNEL 1
1886	115	109	ELECTRIC	CHANNEL 1
1887	123	109	ELECTRIC	CHANNEL 1
1888	3	110	ELECTRIC	CHANNEL 2
1889	11	110	ELECTRIC	CHANNEL 2
1890	19	110	ELECTRIC	CHANNEL 2
1891	27	110	ELECTRIC	CHANNEL 2
1892	35	110	ELECTRIC	CHANNEL 2
1893	43	110	ELECTRIC	CHANNEL 2

February 6, 1979

1894	51	110	ELECTRIC	CHANNEL	2
1895	59	110	ELECTRIC	CHANNEL	2
1896	67	110	ELECTRIC	CHANNEL	2
1897	75	110	ELECTRIC	CHANNEL	2
1898	83	110	ELECTRIC	CHANNEL	2
1899	91	110	ELECTRIC	CHANNEL	2
1900	99	110	ELECTRIC	CHANNEL	2
1901	107	110	ELECTRIC	CHANNEL	2
1902	115	110	ELECTRIC	CHANNEL	2
1903	123	110	ELECTRIC	CHANNEL	2
1904	3	111	ELECTRIC	CHANNEL	3
1905	11	111	ELECTRIC	CHANNEL	3
1906	19	111	ELECTRIC	CHANNEL	3
1907	27	111	ELECTRIC	CHANNEL	3
1908	35	111	ELECTRIC	CHANNEL	3
1909	43	111	ELECTRIC	CHANNEL	3
1910	51	111	ELECTRIC	CHANNEL	3
1911	59	111	ELECTRIC	CHANNEL	3
1912	67	111	ELECTRIC	CHANNEL	3
1913	75	111	ELECTRIC	CHANNEL	3
1914	83	111	ELECTRIC	CHANNEL	3
1915	91	111	ELECTRIC	CHANNEL	3
1916	99	111	ELECTRIC	CHANNEL	3
1917	107	111	ELECTRIC	CHANNEL	3
1918	115	111	ELECTRIC	CHANNEL	3
1919	123	111	ELECTRIC	CHANNEL	3
1920	3	112	ELECTRIC	CHANNEL	4
1921	11	112	ELECTRIC	CHANNEL	4
1922	19	112	ELECTRIC	CHANNEL	4
1923	27	112	ELECTRIC	CHANNEL	4
1924	35	112	ELECTRIC	CHANNEL	4
1925	43	112	ELECTRIC	CHANNEL	4
1926	51	112	ELECTRIC	CHANNEL	4
1927	59	112	ELECTRIC	CHANNEL	4
1928	67	112	ELECTRIC	CHANNEL	4
1929	75	112	ELECTRIC	CHANNEL	4
1930	83	112	ELECTRIC	CHANNEL	4
1931	91	112	ELECTRIC	CHANNEL	4
1932	99	112	ELECTRIC	CHANNEL	4
1933	107	112	ELECTRIC	CHANNEL	4
1934	115	112	ELECTRIC	CHANNEL	4
1935	123	112	ELECTRIC	CHANNEL	4
1936	3	113	MAGNETIC	CHANNEL	1
1937	11	113	MAGNETIC	CHANNEL	1
1938	19	113	MAGNETIC	CHANNEL	1
1939	27	113	MAGNETIC	CHANNEL	1
1940	35	113	MAGNETIC	CHANNEL	1
1941	43	113	MAGNETIC	CHANNEL	1
1942	51	113	MAGNETIC	CHANNEL	1
1943	59	113	MAGNETIC	CHANNEL	1
1944	67	113	MAGNETIC	CHANNEL	1
1945	75	113	MAGNETIC	CHANNEL	1
1946	83	113	MAGNETIC	CHANNEL	1
1947	91	113	MAGNETIC	CHANNEL	1
1948	99	113	MAGNETIC	CHANNEL	1
1949	107	113	MAGNETIC	CHANNEL	1

February 6, 1979

1950	115	113	MAGNETIC CHANNEL 1
1951	123	113	MAGNETIC CHANNEL 1
1952	3	114	MAGNETIC CHANNEL 2
1953	11	114	MAGNETIC CHANNEL 2
1954	19	114	MAGNETIC CHANNEL 2
1955	27	114	MAGNETIC CHANNEL 2
1956	35	114	MAGNETIC CHANNEL 2
1957	43	114	MAGNETIC CHANNEL 2
1958	51	114	MAGNETIC CHANNEL 2
1959	59	114	MAGNETIC CHANNEL 2
1960	67	114	MAGNETIC CHANNEL 2
1961	75	114	MAGNETIC CHANNEL 2
1962	83	114	MAGNETIC CHANNEL 2
1963	91	114	MAGNETIC CHANNEL 2
1964	99	114	MAGNETIC CHANNEL 2
1965	107	114	MAGNETIC CHANNEL 2
1966	115	114	MAGNETIC CHANNEL 2
1967	123	114	MAGNETIC CHANNEL 2
1968	3	115	MAGNETIC CHANNEL 3
1969	11	115	MAGNETIC CHANNEL 3
1970	19	115	MAGNETIC CHANNEL 3
1971	27	115	MAGNETIC CHANNEL 3
1972	35	115	MAGNETIC CHANNEL 3
1973	43	115	MAGNETIC CHANNEL 3
1974	51	115	MAGNETIC CHANNEL 3
1975	59	115	MAGNETIC CHANNEL 3
1976	67	115	MAGNETIC CHANNEL 3
1977	75	115	MAGNETIC CHANNEL 3
1978	83	115	MAGNETIC CHANNEL 3
1979	91	115	MAGNETIC CHANNEL 3
1980	99	115	MAGNETIC CHANNEL 3
1981	107	115	MAGNETIC CHANNEL 3
1982	115	115	MAGNETIC CHANNEL 3
1983	123	115	MAGNETIC CHANNEL 3
1984	3	116	MAGNETIC CHANNEL 4
1985	11	116	MAGNETIC CHANNEL 4
1986	19	116	MAGNETIC CHANNEL 4
1987	27	116	MAGNETIC CHANNEL 4
1988	35	116	MAGNETIC CHANNEL 4
1989	43	116	MAGNETIC CHANNEL 4
1990	51	116	MAGNETIC CHANNEL 4
1991	59	116	MAGNETIC CHANNEL 4
1992	67	116	MAGNETIC CHANNEL 4
1993	75	116	MAGNETIC CHANNEL 4
1994	83	116	MAGNETIC CHANNEL 4
1995	91	116	MAGNETIC CHANNEL 4
1996	99	116	MAGNETIC CHANNEL 4
1997	107	116	MAGNETIC CHANNEL 4
1998	115	116	MAGNETIC CHANNEL 4
1999	123	116	MAGNETIC CHANNEL 4
2000	5	103	MSB--<+CALV><-CALV><MODV><MODE><T><T><T><T>---LSB
2001	0	77	DSAS TIME TAG AND ANGLE LOW BYTE
2002	0	76	DSAS TIME TAG AND ANGLE MIDDLE BYTE
2003	0	75	DSAS TIME TAG AND ANGLE HIGH BYTE
2004	32	77	DSAS TIME TAG AND ANGLE LOW BYTE
2005	32	76	DSAS TIME TAG AND ANGLE MIDDLE BYTE

2006	32	75	DSAS TIME TAG AND ANGLE HIGH BYTE
2007	64	77	DSAS TIME TAG AND ANGLE LOW BYTE
2008	64	76	DSAS TIME TAG AND ANGLE MIDDLE BYTE
2009	64	75	DSAS TIME TAG AND ANGLE HIGH BYTE
2010	96	77	DSAS TIME TAG AND ANGLE LOW BYTE
2011	96	76	DSAS TIME TAG AND ANGLE MIDDLE BYTE
2012	96	75	DSAS TIME TAG AND ANGLE HIGH BYTE
2013	3	76	SC-10 COMMON MODE 1 (-)
2014	19	76	SC-10 (-) CM1
2015	35	76	SC-10 (-) CM1
2016	51	76	SC-10 (-) CM1
2017	67	76	SC-10 (-) CM1
2018	83	76	SC-10 (-) CM1
2019	99	76	SC-10 (-) CM1
2020	115	76	SC-10 (-) CM1
2021	3	77	SC-10 COMMON MODE 2 (-)
2022	19	77	SC-10 (-) CM2
2023	35	77	SC-10 (-) CM2
2024	51	77	SC-10 (-) CM2
2025	67	77	SC-10 (-) CM2
2026	83	77	SC-10 (-) CM2
2027	99	77	SC-10 (-) CM2
2028	115	77	SC-10 (-) CM2
2029	3	78	SC-10 COMMON MODE 3 (-)
2030	19	78	SC-10 (-) CM3
2031	35	78	SC-10 (-) CM3
2032	51	78	SC-10 (-) CM3
2033	67	78	SC-10 (-) CM3
2034	83	78	SC-10 (-) CM3
2035	99	78	SC-10 (-) CM3
2036	115	78	SC-10 (-) CM3
2037	3	108	SC-10 COMMON MODE 1 (+)
2038	19	108	SC-10 (+) CM1
2039	35	108	SC-10 (+) CM1
2040	51	108	SC-10 (+) CM1
2041	67	108	SC-10 (+) CM1
2042	83	108	SC-10 (+) CM1
2043	99	108	SC-10 (+) CM1
2044	115	108	SC-10 (+) CM1
2045	f111	0	
2046	f111	0	
2047	f111	0	

APPENDIX 7

COMMAND LIST

APPENDIX 7

COMMAND LIST

TM VERIFICATION AND REFERENCE

STATE OCTAL BINARY BITS 6-32

S	CMD NO.	NAME	STATE	OCTAL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
	7000	POWER ON	L	020000246	00001 00000000 0000010100110	
	7001	POWER OFF	U	020000258	00001 00000000 000001010110	
	7002	NS DEFLECTION VOLTAGE INHIBIT	L	020000001	00001 00000000 000000000001	
	7003	EW DEFLECTION VOLTAGE INHIBIT	L	020000101	00001 00000000 000001000001	
	7004	FD DEFLECTION VOLTAGE INHIBIT	L	020000301	00001 00000000 000001100001	
	7005	UNLATCH CMDS 7002, 7003, 7004	U	020000251	00001 00000000 000001000001	
	7011	NS SPIRALTRON VOLTAGE ON	L	020000304	00001 00000000 000001000001	
	7012	EW SPIRALTRON VOLTAGE ON	L	020000241	00001 00000000 000001010001	
	7013	FD SPIRALTRON VOLTAGE ON	L	020000141	00001 00000000 000001100001	
	7015	UNLATCH CMDS 7011, 7012, 7013	U	020000251	00001 00000000 000001010001	
	7020	PCU SPIRALTRON BIAS	L	020000341	00001 00000000 000001100001	
	7021	NS SPIRALTRON BIAS	L	020000311	00001 00000000 000001010001	
	7022	EW SPIRALTRON BIAS	L	020000311	00001 00000000 000001010001	
	7023	FD SPIRALTRON BIAS	L	020000311	00001 00000000 000001010001	
	7025	UNLATCH CMDS 7020, 7021, 7022, 7023	U	020000251	00001 00000000 000001010001	
	7030	MOTOR POWER	L	020000051	00001 00000000 000001010001	
	7031	MOTOR VOLTAGE	L	020000021	00001 00000000 000001010001	
	7035	UNLATCH CMDS 7030, 7031	U	020000071	00001 00000000 000001010001	
	7040	MICROPROCESSOR BYPASS	L	020000151	00001 00000000 000001101001	
	7041	MICROPROCESSOR OFF	L	020000351	00001 00000000 000001101001	
	7045	UNLATCH CMDS 7040, 7041	U	020000171	00001 00000000 000001101001	
	7100	NSLL 1, REVERSAL ANGLE	S	260000001	01011 00000000 000000000001	J8510
	7101	NSLL 2, REVERSAL ANGLE	S	260000002	01011 00000000 000000000010	J8510
	7102	NSLL 3, REVERSAL ANGLE	S	260000003	01011 00000000 000000000011	J8510
	7103	NSLL 4, REVERSAL ANGLE	S	260000004	01011 00000000 000000000100	J8510
	7104	NSLL 5, REVERSAL ANGLE	S	260000005	01011 00000000 000000000101	J8510
	7105	NSLL 6, REVERSAL ANGLE	S	260000006	01011 00000000 000000000110	J8510
	7106	NSLL 7, REVERSAL ANGLE	S	260000007	01011 00000000 000000000111	J8510
	7107	NSLL 8, REVERSAL ANGLE	S	260000008	01011 00000000 000000000100	J8510
	7108	NSLL 9, REVERSAL ANGLE	S	260000009	01011 00000000 000000000101	J8510
	7109	NSLL 10, REVERSAL ANGLE	S	260000010	01011 00000000 000000000110	J8510
	7110	NSLL 11, REVERSAL ANGLE	S	260000011	01011 00000000 000000000111	J8510
	7111	NSLL 12, REVERSAL ANGLE	S	260000012	01011 00000000 000000001000	J8510
	7112	NSLL 13, REVERSAL ANGLE	S	260000013	01011 00000000 000000001001	J8510
	7113	NSLL 14, REVERSAL ANGLE	S	260000014	01011 00000000 000000001010	J8510
	7114	NSLL 15, REVERSAL ANGLE	S	260000015	01011 00000000 000000001011	J8510
	7115	NSLL 16, REVERSAL ANGLE	S	260000016	01011 00000000 000000001100	J8510
	7116	NSLL 17, REVERSAL ANGLE	S	260000017	01011 00000000 000000001101	J8510
	7117	NSLL 18, REVERSAL ANGLE	S	260000018	01011 00000000 000000001110	J8510
	7118	NSLL 19, REVERSAL ANGLE	S	260000019	01011 00000000 000000001111	J8510
	7119	NSLL 20, REVERSAL ANGLE	S	260000020	01011 00000000 000000001000	J8510
	7120	NSLL 21, REVERSAL ANGLE	S	260000021	01011 00000000 000000001001	J8510
	7121	NSLL 22, REVERSAL ANGLE	S	260000022	01011 00000000 000000001010	J8510
	7122	NSLL 23, REVERSAL ANGLE	S	260000023	01011 00000000 000000001011	J8510
	7123	NSLL 24, REVERSAL ANGLE	S	260000024	01011 00000000 000000001100	J8510
	7124	NSLL 25, REVERSAL ANGLE	S	260000025	01011 00000000 000000001101	J8510
	7125	NSLL 26, REVERSAL ANGLE	S	260000026	01011 00000000 000000001110	J8510
	7126	NSLL 27, REVERSAL ANGLE	S	260000027	01011 00000000 000000001111	J8510
	7127	NSLL 28, REVERSAL ANGLE	S	260000028	01011 00000000 000000001000	J8510
	7128	NSLL 29, REVERSAL ANGLE	S	260000029	01011 00000000 000000001001	J8510
	7129	NSLL 30, REVERSAL ANGLE	S	260000030	01011 00000000 000000001010	J8510
	7130	NSLL 31, REVERSAL ANGLE	S	260000031	01011 00000000 000000001011	J8510
	7131	NSLL 32, REVERSAL ANGLE	S	260000032	01011 00000000 000000001100	J8510
	7132	NSLL 33, REVERSAL ANGLE	S	260000033	01011 00000000 000000001101	J8510
	7133	NSLL 34, REVERSAL ANGLE	S	260000034	01011 00000000 000000001110	J8510
	7134	NSLL 35, REVERSAL ANGLE	S	260000035	01011 00000000 000000001111	J8510
	7135	NSLL 36, REVERSAL ANGLE	S	260000036	01011 00000000 000000001000	J8510
	7136	NSLL 37, REVERSAL ANGLE	S	260000037	01011 00000000 000000001001	J8510
	7137	NSLL 38, REVERSAL ANGLE	S	260000038	01011 00000000 000000001010	J8510
	7138	NSLL 39, REVERSAL ANGLE	S	260000039	01011 00000000 000000001011	J8510
	7139	NSLL 40, REVERSAL ANGLE	S	260000040	01011 00000000 000000001100	J8510
	7140	NSLL 41, REVERSAL ANGLE	S	260000041	01011 00000000 000000001101	J8510
	7141	NSLL 42, REVERSAL ANGLE	S	260000042	01011 00000000 000000001110	J8510
	7142	NSLL 43, REVERSAL ANGLE	S	260000043	01011 00000000 000000001111	J8510
	7143	NSLL 44, REVERSAL ANGLE	S	260000044	01011 00000000 000000001000	J8510
	7144	NSLL 45, REVERSAL ANGLE	S	260000045	01011 00000000 000000001001	J8510
	7145	NSLL 46, REVERSAL ANGLE	S	260000046	01011 00000000 000000001010	J8510
	7146	NSLL 47, REVERSAL ANGLE	S	260000047	01011 00000000 000000001011	J8510
	7147	NSLL 48, REVERSAL ANGLE	S	260000048	01011 00000000 000000001100	J8510
	7148	NSLL 49, REVERSAL ANGLE	S	260000049	01011 00000000 000000001101	J8510
	7149	NSLL 50, REVERSAL ANGLE	S	260000050	01011 00000000 000000001110	J8510
	7150	NSLL 51, REVERSAL ANGLE	S	260000051	01011 00000000 000000001111	J8510
	7151	NSLL 52, REVERSAL ANGLE	S	260000052	01011 00000000 000000001000	J8510
	7152	NSLL 53, REVERSAL ANGLE	S	260000053	01011 00000000 000000001001	J8510
	7153	NSLL 54, REVERSAL ANGLE	S	260000054	01011 00000000 000000001010	J8510
	7154	NSLL 55, REVERSAL ANGLE	S	260000055	01011 00000000 000000001011	J8510
	7155	NSLL 56, REVERSAL ANGLE	S	260000056	01011 00000000 000000001100	J8510
	7156	NSLL 57, REVERSAL ANGLE	S	260000057	01011 00000000 000000001101	J8510
	7157	NSLL 58, REVERSAL ANGLE	S	260000058	01011 00000000 000000001110	J8510
	7158	NSLL 59, REVERSAL ANGLE	S	260000059	01011 00000000 000000001111	J8510
	7159	NSLL 60, REVERSAL ANGLE	S	260000060	01011 00000000 000000001000	J8510
	7160	NSLL 61, REVERSAL ANGLE	S	260000061	01011 00000000 000000001001	J8510
	7161	NSLL 62, REVERSAL ANGLE	S	260000062	01011 00000000 000000001010	J8510
	7162	NSLL 63, REVERSAL ANGLE	S	260000063	01011 00000000 000000001011	J8510
	7163	NSLL 64, REVERSAL ANGLE	S	260000064	01011 00000000 000000001100	J8510
	7164	NSLL 65, REVERSAL ANGLE	S	260000065	01011 00000000 000000001101	J8510
	7165	NSLL 66, REVERSAL ANGLE	S	260000066	01011 00000000 000000001110	J8510
	7166	NSLL 67, REVERSAL ANGLE	S	260000067	01011 00000000 000000001111	J8510
	7167	NSLL 68, REVERSAL ANGLE	S	260000068	01011 00000000 000000001000	J8510
	7168	NSLL 69, REVERSAL ANGLE	S	260000069	01011 00000000 000000001001	J8510
	7169	NSLL 70, REVERSAL ANGLE	S	260000070	01011 00000000 000000001010	J8510
	7170	NSLL 71, REVERSAL ANGLE	S	260000071	01011 00000000 000000001011	J8510
	7171	NSLL 72, REVERSAL ANGLE	S	260000072	01011 00000000 000000001100	J8510
	7172	NSLL 73, REVERSAL ANGLE	S	260000073	01011 00000000 000000001101	J8510
	7173	NSLL 74, REVERSAL ANGLE	S	260000074	01011 00000000 000000001110	J8510
	7174	NSLL 75, REVERSAL ANGLE	S	260000075	01011 00000000 000000001111	J8510
	7175	NSLL 76, REVERSAL ANGLE	S	260000076	01011 00000000 000000001000	J8510
	7176	NSLL 77, REVERSAL ANGLE	S	260000077	01011 00000000 000000001001	J8510
	7177	NSLL 78, REVERSAL ANGLE	S	260000078	01011 00000000 000000001010	J8510
	7178	NSLL 79, REVERSAL ANGLE	S	260000079	01011 00000000 000000001011	J8510
	7179	NSLL 80, REVERSAL ANGLE	S	260000080	01011 00000000 000000001100	J8510
	7180	NSLL 81, REVERSAL ANGLE	S	260000081	01011 00000000 000000001101	J8510
	7181	NSLL 82, REVERSAL ANGLE	S	260000082	01011 00000000 000000001110	J8510
	7182	NSLL 83, REVERSAL ANGLE	S	260000083	01011 00000000 000000001111	J8510
	7183	NSLL 84, REVERSAL ANGLE	S	260000084	01011 00000000 000000001000	J8510
	7184	NSLL 85, REVERSAL ANGLE	S	260000085	01011 00000000 000000001001	J8510
	7185	NSLL 86, REVERSAL ANGLE	S	260000086	01011 00000000 000000001010	J8510
	7186	NSLL 87, REVERSAL ANGLE	S	260000087	01011 00000000 000000001011	J8510
	7187	NSLL 88, REVERSAL ANGLE	S	260000088	01011 00000000 000000001100	J8510
	7188	NSLL 89, REVERSAL ANGLE	S	260000089	01011 00000000 000000001101	J8510
	7189	NSLL 90, REVERSAL ANGLE	S	260000090	01011 00000000 000000001110	J8510
	7190	NSLL 91, REVERSAL ANGLE	S	260000091	01011 00000000 000000001111	J8510
	7191	NSLL 92, REVERSAL ANGLE	S	260000092	01011 00000000 000000001000	J8510
	7192	NSLL 93, REVERSAL ANGLE	S	260000093	01011 00000000 000000001001	J8510
	7193	NSLL 94, REVERSAL ANGLE	S	260000094	01011 00000000 000000001010	J8510
	7194	NSLL 95, REVERSAL ANGLE	S	260000095	01011 00000000 000000001011	J8510
	7195	NSLL 96, REVERSAL ANGLE	S	260000096	01011 00000000 000000001100	J8510
	7196	NSLL 97, REVERSAL ANGLE	S	260000097	01011 00000000 000000001101	J8510
	7197	NSLL 98, REVERSAL ANGLE	S	260000098	01011 00000000 000000001110	J8510
	7198	NSLL 99, REVERSAL ANGLE	S	260000099	01011 00000000 000000001111	J8510
	7199	NSLL 100, REVERSAL ANGLE	S	260000100	01011 00000000 000000001000	J8510

P78-2 COMMAND LIST 08-18-78 REV ?
SC9 EXPERIMENT

PAGE 2

STATE = (PULSE(P), LATCHING(L), UNLATCHING(U), MOMENTARY(M), SERIAL(S), NON-REDUNDANT RELAY(R))
***** TEST LIST : NO PARITY *****

S	CMD NO.	NAME	REVERSAL	ANGLE	<	22.56	DEG
7129	NSLL 30.	REVERSAL	ANGLE	<	22.56	DEG	
7130	NSLL 31.	REVERSAL	ANGLE	<	24.25	DEG	
7131	NSLL 32.	REVERSAL	ANGLE	<	25.65	DEG	
7132	NSLL 33.	REVERSAL	ANGLE	<	27.05	DEG	
7133	NSLL 34.	REVERSAL	ANGLE	<	28.44	DEG	
7134	NSLL 35.	REVERSAL	ANGLE	<	29.84	DEG	
7135	NSLL 36.	REVERSAL	ANGLE	<	31.23	DEG	
7136	NSLL 37.	REVERSAL	ANGLE	<	32.63	DEG	
7137	NSLL 38.	REVERSAL	ANGLE	<	34.02	DEG	
7138	NSLL 39.	REVERSAL	ANGLE	<	35.42	DEG	
7139	NSLL 40.	REVERSAL	ANGLE	<	36.81	DEG	
7140	NSLL 41.	REVERSAL	ANGLE	<	38.21	DEG	
7141	NSLL 42.	REVERSAL	ANGLE	<	39.60	DEG	
7142	NSLL 43.	REVERSAL	ANGLE	<	41.00	DEG	
7143	NSLL 44.	REVERSAL	ANGLE	<	42.40	DEG	
7144	NSLL 45.	REVERSAL	ANGLE	<	43.79	DEG	
7145	NSLL 46.	REVERSAL	ANGLE	<	45.19	DEG	
7146	NSLL 47.	REVERSAL	ANGLE	<	46.58	DEG	
7147	NSLL 48.	REVERSAL	ANGLE	<	47.98	DEG	
7148	NSLL 49.	REVERSAL	ANGLE	<	49.37	DEG	
7149	NSLL 50.	REVERSAL	ANGLE	<	50.77	DEG	
7150	NSLL 51.	REVERSAL	ANGLE	<	52.16	DEG	
7151	NSLL 52.	REVERSAL	ANGLE	<	53.56	DEG	
7152	NSLL 53.	REVERSAL	ANGLE	<	54.95	DEG	
7153	NSLL 54.	REVERSAL	ANGLE	<	56.35	DEG	
7154	NSLL 55.	REVERSAL	ANGLE	<	57.74	DEG	
7155	NSLL 56.	REVERSAL	ANGLE	<	59.14	DEG	
7156	NSLL 57.	REVERSAL	ANGLE	<	60.53	DEG	
7157	NSLL 58.	REVERSAL	ANGLE	<	61.93	DEG	
7158	NSLL 59.	REVERSAL	ANGLE	<	63.33	DEG	
7159	NSLL 60.	REVERSAL	ANGLE	<	64.72	DEG	
7160	NSLL 61.	REVERSAL	ANGLE	<	66.12	DEG	
7161	NSLL 62.	REVERSAL	ANGLE	<	67.51	DEG	
7162	NSLL 63.	REVERSAL	ANGLE	<	68.91	DEG	
7163	NSLL 64.	REVERSAL	ANGLE	<	70.30	DEG	
7164	NSLL 65.	REVERSAL	ANGLE	<	71.70	DEG	
7165	NSLL 66.	REVERSAL	ANGLE	<	73.09	DEG	
7166	NSLL 67.	REVERSAL	ANGLE	<	74.49	DEG	
7167	NSLL 68.	REVERSAL	ANGLE	<	75.88	DEG	
7168	NSLL 69.	REVERSAL	ANGLE	<	77.28	DEG	
7169	NSLL 70.	REVERSAL	ANGLE	<	78.67	DEG	
7170	NSLL 71.	REVERSAL	ANGLE	<	80.07	DEG	
7171	NSLL 72.	REVERSAL	ANGLE	<	81.47	DEG	
7172	NSLL 73.	REVERSAL	ANGLE	<	82.86	DEG	
7173	NSLL 74.	REVERSAL	ANGLE	<	84.26	DEG	
7174	NSLL 75.	REVERSAL	ANGLE	<	85.65	DEG	
7175	NSLL 76.	REVERSAL	ANGLE	<	87.05	DEG	
7176	NSLL 77.	REVERSAL	ANGLE	<	88.44	DEG	
7177	NSLL 78.	REVERSAL	ANGLE	<	89.84	DEG	
7178	NSLL 79.	REVERSAL	ANGLE	<	91.23	DEG	

A-80

PL5863011

08-18-78 REV ?

PAGE 6.2-089

STATE	OCTAL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
S	260000036	01011 00000000 0000000011110	J8510
S	260000037	01011 00000000 0000000011111	J8510
S	260000040	01011 00000000 0000000010000	J8510
S	260000041	01011 00000000 0000000010000	J8510
S	260000042	01011 00000000 0000000010000	J8510
S	260000043	01011 00000000 0000000010001	J8510
S	260000044	01011 00000000 0000000010010	J8510
S	260000045	01011 00000000 0000000010010	J8510
S	260000046	01011 00000000 0000000010011	J8510
S	260000047	01011 00000000 0000000010011	J8510
S	260000050	01011 00000000 0000000010000	J8510
S	260000051	01011 00000000 0000000010001	J8510
S	260000052	01011 00000000 0000000010010	J8510
S	260000053	01011 00000000 0000000010011	J8510
S	260000054	01011 00000000 0000000010010	J8510
S	260000055	01011 00000000 0000000010011	J8510
S	260000056	01011 00000000 0000000010011	J8510
S	260000057	01011 00000000 0000000010011	J8510
S	260000060	01011 00000000 0000000010000	J8510
S	260000061	01011 00000000 0000000010001	J8510
S	260000062	01011 00000000 0000000010010	J8510
S	260000063	01011 00000000 0000000010011	J8510
S	260000064	01011 00000000 0000000010010	J8510
S	260000065	01011 00000000 0000000010011	J8510
S	260000066	01011 00000000 0000000010011	J8510
S	260000067	01011 00000000 0000000010011	J8510
S	260000070	01011 00000000 0000000010000	J8510
S	260000071	01011 00000000 0000000010001	J8510
S	260000072	01011 00000000 0000000010010	J8510
S	260000073	01011 00000000 0000000010011	J8510
S	260000074	01011 00000000 0000000010011	J8510
S	260000075	01011 00000000 0000000010011	J8510
S	260000076	01011 00000000 0000000010011	J8510
S	260000077	01011 00000000 0000000010011	J8510
S	260000100	01011 00000000 0000000010000	J8510
S	260000101	01011 00000000 0000000010000	J8510
S	260000102	01011 00000000 0000000010000	J8510
S	260000103	01011 00000000 0000000010000	J8510
S	260000104	01011 00000000 0000000010000	J8510
S	260000105	01011 00000000 0000000010000	J8510
S	260000106	01011 00000000 0000000010000	J8510
S	260000107	01011 00000000 0000000010000	J8510
S	260000110	01011 00000000 0000000010000	J8510
S	260000112	01011 00000000 0000000010000	J8510
S	260000113	01011 00000000 0000000010000	J8510
S	260000114	01011 00000000 0000000010000	J8510
S	260000115	01011 00000000 0000000010000	J8510
S	260000116	01011 00000000 0000000010000	J8510
S	260000117	01011 00000000 0000000010000	J8510

P78-2 COMMAND LIST 06-18-78 REV ?
SC9 EXPERIMENT

STATE = (PULSE(P), LATCHING(L), UNLATCHING(U), MOMENTARY(M), SERIAL(S), NON-REDUNDANT RELAY(R))
***** TEST LIST : NO PARITY *****

S CMD NO.	NAME	REVERSAL ANGLE	STATE	DCAL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
7179	NSLL 80,	REVERSAL ANGLE < 92.63 DEG	S	260000120	01011 00000000 000001010000	J8510
7180	NSLL 81,	REVERSAL ANGLE < 94.02 DEG	S	260000121	01011 00000000 000001010001	J8510
7181	NSLL 82,	REVERSAL ANGLE < 95.42 DEG	S	260000122	01011 00000000 000001010010	J8510
7182	NSLL 83,	REVERSAL ANGLE < 96.81 DEG	S	260000123	01011 00000000 000001010011	J8510
7183	NSLL 84,	REVERSAL ANGLE < 98.21 DEG	S	260000124	01011 00000000 000001010100	J8510
7184	NSLL 85,	REVERSAL ANGLE < 99.60 DEG	S	260000125	01011 00000000 000001010101	J8510
7185	NSLL 86,	REVERSAL ANGLE < 101.00 DEG	S	260000126	01011 00000000 000001010110	J8510
7186	NSLL 87,	REVERSAL ANGLE < 102.40 DEG	S	260000127	01011 00000000 000001010111	J8510
7187	NSLL 88,	REVERSAL ANGLE < 103.79 DEG	S	260000130	01011 00000000 000001011000	J8510
7188	NSLL 89,	REVERSAL ANGLE < 105.19 DEG	S	260000131	01011 00000000 000001011001	J8510
7189	NSLL 90,	REVERSAL ANGLE < 106.58 DEG	S	260000132	01011 00000000 000001011010	J8510
7190	NSLL 91,	REVERSAL ANGLE < 107.98 DEG	S	260000133	01011 00000000 000001011011	J8510
7191	NSLL 92,	REVERSAL ANGLE < 109.37 DEG	S	260000134	01011 00000000 000001011100	J8510
7192	NSLL 93,	REVERSAL ANGLE < 110.77 DEG	S	260000135	01011 00000000 000001011101	J8510
7193	NSLL 94,	REVERSAL ANGLE < 112.16 DEG	S	260000136	01011 00000000 000001011110	J8510
7194	NSLL 95,	REVERSAL ANGLE < 113.56 DEG	S	260000137	01011 00000000 000001011111	J8510
7195	NSLL 96,	REVERSAL ANGLE < 114.95 DEG	S	260000140	01011 00000000 000001100000	J8510
7196	NSLL 97,	REVERSAL ANGLE < 116.35 DEG	S	260000141	01011 00000000 000001100001	J8510
7197	NSLL 98,	REVERSAL ANGLE < 117.74 DEG	S	260000142	01011 00000000 000001100010	J8510
7198	NSLL 99,	REVERSAL ANGLE < 119.14 DEG	S	260000143	01011 00000000 000001100011	J8510
7199	NSLL 100,	REVERSAL ANGLE < 120.53 DEG	S	260000144	01011 00000000 000001100100	J8510
7200	NSLL 101,	REVERSAL ANGLE < 121.93 DEG	S	260000145	01011 00000000 000001100101	J8510
7201	NSLL 102,	REVERSAL ANGLE < 123.33 DEG	S	260000146	01011 00000000 000001100110	J8510
7202	NSLL 103,	REVERSAL ANGLE < 124.72 DEG	S	260000147	01011 00000000 000001100111	J8510
7203	NSLL 104,	REVERSAL ANGLE < 126.12 DEG	S	260000150	01011 00000000 000001101000	J8510
7204	NSLL 105,	REVERSAL ANGLE < 127.51 DEG	S	260000151	01011 00000000 000001101001	J8510
7205	NSLL 106,	REVERSAL ANGLE < 128.91 DEG	S	260000152	01011 00000000 000001101010	J8510
7206	NSLL 107,	REVERSAL ANGLE < 130.30 DEG	S	260000153	01011 00000000 000001101011	J8510
7207	NSLL 108,	REVERSAL ANGLE < 131.70 DEG	S	260000154	01011 00000000 000001101100	J8510
7208	NSLL 109,	REVERSAL ANGLE < 133.09 DEG	S	260000155	01011 00000000 000001101101	J8510
7209	NSLL 110,	REVERSAL ANGLE < 134.49 DEG	S	260000156	01011 00000000 000001101110	J8510
7210	NSLL 111,	REVERSAL ANGLE < 135.88 DEG	S	260000157	01011 00000000 000001101111	J8510
7211	NSLL 112,	REVERSAL ANGLE < 137.28 DEG	S	260000150	01011 00000000 000001100000	J8510
7212	NSLL 113,	REVERSAL ANGLE < 138.67 DEG	S	260000161	01011 00000000 000001100001	J8510
7213	NSLL 114,	REVERSAL ANGLE < 140.07 DEG	S	260000162	01011 00000000 000001100010	J8510
7214	NSLL 115,	REVERSAL ANGLE < 141.47 DEG	S	260000163	01011 00000000 000001100011	J8510
7215	NSLL 116,	REVERSAL ANGLE < 142.86 DEG	S	260000164	01011 00000000 000001101000	J8510
7216	NSLL 117,	REVERSAL ANGLE < 144.26 DEG	S	260000165	01011 00000000 000001101001	J8510
7217	NSLL 118,	REVERSAL ANGLE < 145.65 DEG	S	260000166	01011 00000000 000001101010	J8510
7218	NSLL 119,	REVERSAL ANGLE < 147.05 DEG	S	260000167	01011 00000000 000001101011	J8510
7219	NSLL 120,	REVERSAL ANGLE < 148.44 DEG	S	260000170	01011 00000000 000001101000	J8510
7220	NSLL 121,	REVERSAL ANGLE < 149.84 DEG	S	260000171	01011 00000000 000001101001	J8510
7221	NSLL 122,	REVERSAL ANGLE < 151.23 DEG	S	260000172	01011 00000000 000001101010	J8510
7222	NSLL 123,	REVERSAL ANGLE < 152.63 DEG	S	260000173	01011 00000000 000001101011	J8510
7223	NSLL 124,	REVERSAL ANGLE < 154.02 DEG	S	260000174	01011 00000000 000001101100	J8510
7224	NSLL 125,	REVERSAL ANGLE < 155.42 DEG	S	260000175	01011 00000000 000001101101	J8510
7225	NSLL 126,	REVERSAL ANGLE < 156.81 DEG	S	260000176	01011 00000000 000001101110	J8510
7226	NSLL 127,	REVERSAL ANGLE < 158.21 DEG	S	260000177	01011 00000000 000001101111	J8510
7227	NSLL 128,	REVERSAL ANGLE < 159.60 DEG	S	260000200	01011 00000000 000001000000	J8510
7228	NSLL 129,	REVERSAL ANGLE < 161.00 DEG	S	260000201	01011 00000000 000001000001	J8510

A-81

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06-18-78 REV ?

P78-2 COMMAND LIST 08-18-78 REV ? STATE = (PULSE(P), LATCHING(L), UNLATCHING(U), MOMENTARY(M), SERIAL(S), NON-REDUNDANT RELAY(R))
SC9 EXPERIMENT ***** TEST LIST : NO PARITY *****

S CMD NO.	NAME	REVERSAL	ANGLE	STATE	CCTAL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
7229	NSLL 130.	REVERSAL	ANGLE < 162.40 DEG	S	260000202	01011 000000000 0000010000010	J8510
7230	NSLL 131.	REVERSAL	ANGLE < 163.79 DEG	S	260000203	01011 000000000 0000010000011	J8510
7231	NSLL 132.	REVERSAL	ANGLE < 165.19 DEG	S	260000204	01011 000000000 0000010000010	J8510
7232	NSLL 133.	REVERSAL	ANGLE < 166.58 DEG	S	260000205	01011 000000000 0000010000011	J8510
7233	NSLL 134.	REVERSAL	ANGLE < 167.98 DEG	S	260000206	01011 000000000 0000010000010	J8510
7234	NSLL 135.	REVERSAL	ANGLE < 169.37 DEG	S	260000207	01011 000000000 0000010000011	J8510
7235	NSLL 136.	REVERSAL	ANGLE < 170.77 DEG	S	260000208	01011 000000000 0000010000010	J8510
7236	NSLL 137.	REVERSAL	ANGLE < 172.16 DEG	S	260000209	01011 000000000 0000010000011	J8510
7237	NSLL 138.	REVERSAL	ANGLE < 173.56 DEG	S	260000210	01011 000000000 0000010000010	J8510
7238	NSLL 139.	REVERSAL	ANGLE < 174.95 DEG	S	260000211	01011 000000000 0000010000011	J8510
7239	NSLL 140.	REVERSAL	ANGLE < 176.35 DEG	S	260000212	01011 000000000 0000010000010	J8510
7240	NSLL 141.	REVERSAL	ANGLE < 177.74 DEG	S	260000213	01011 000000000 0000010000011	J8510
7241	NSLL 142.	REVERSAL	ANGLE < 179.14 DEG	S	260000214	01011 000000000 0000010000010	J8510
7242	NSLL 143.	REVERSAL	ANGLE < 180.53 DEG	S	260000215	01011 000000000 0000010000011	J8510
7243	NSLL 144.	REVERSAL	ANGLE < 181.93 DEG	S	260000216	01011 000000000 0000010000010	J8510
7244	NSLL 145.	REVERSAL	ANGLE < 183.33 DEG	S	260000217	01011 000000000 0000010000011	J8510
7245	NSLL 146.	REVERSAL	ANGLE < 184.72 DEG	S	260000218	01011 000000000 0000010000010	J8510
7246	NSLL 147.	REVERSAL	ANGLE < 186.12 DEG	S	260000219	01011 000000000 0000010000011	J8510
7247	NSLL 148.	REVERSAL	ANGLE < 187.51 DEG	S	260000220	01011 000000000 0000010000010	J8510
7248	NSLL 149.	REVERSAL	ANGLE < 188.91 DEG	S	260000221	01011 000000000 0000010000011	J8510
7249	NSLL 150.	REVERSAL	ANGLE < 190.30 DEG	S	260000222	01011 000000000 0000010000010	J8510
7250	NSLL 151.	REVERSAL	ANGLE < 191.70 DEG	S	260000223	01011 000000000 0000010000011	J8510
7251	NSLL 152.	REVERSAL	ANGLE < 193.09 DEG	S	260000224	01011 000000000 0000010000010	J8510
7252	NSLL 153.	REVERSAL	ANGLE < 194.49 DEG	S	260000225	01011 000000000 0000010000011	J8510
7253	NSLL 154.	REVERSAL	ANGLE < 195.88 DEG	S	260000226	01011 000000000 0000010000010	J8510
7254	NSLL 155.	REVERSAL	ANGLE < 197.28 DEG	S	260000227	01011 000000000 0000010000011	J8510
7255	NSLL 156.	REVERSAL	ANGLE < 198.67 DEG	S	260000228	01011 000000000 0000010000010	J8510
7256	NSLL 157.	REVERSAL	ANGLE < 200.07 DEG	S	260000229	01011 000000000 0000010000011	J8510
7257	NSLL 158.	REVERSAL	ANGLE < 201.47 DEG	S	260000230	01011 000000000 0000010000010	J8510
7258	NSLL 159.	REVERSAL	ANGLE < 202.86 DEG	S	260000231	01011 000000000 0000010000011	J8510
7259	NSLL 160.	REVERSAL	ANGLE < 204.26 DEG	S	260000232	01011 000000000 0000010000010	J8510
7260	NSLL 161.	REVERSAL	ANGLE < 205.65 DEG	S	260000233	01011 000000000 0000010000011	J8510
7261	NSLL 162.	REVERSAL	ANGLE < 207.05 DEG	S	260000234	01011 000000000 0000010000010	J8510
7262	NSLL 163.	REVERSAL	ANGLE < 208.44 DEG	S	260000235	01011 000000000 0000010000011	J8510
7263	NSLL 164.	REVERSAL	ANGLE < 209.84 DEG	S	260000236	01011 000000000 0000010000010	J8510
7264	NSLL 165.	REVERSAL	ANGLE < 211.23 DEG	S	260000237	01011 000000000 0000010000011	J8510
7265	NSLL 166.	REVERSAL	ANGLE < 212.63 DEG	S	260000238	01011 000000000 0000010000010	J8510
7266	NSLL 167.	REVERSAL	ANGLE < 214.02 DEG	S	260000239	01011 000000000 0000010000011	J8510
7267	NSLL 168.	REVERSAL	ANGLE < 215.42 DEG	S	260000240	01011 000000000 0000010000010	J8510
7268	NSLL 169.	REVERSAL	ANGLE < 216.81 DEG	S	260000241	01011 000000000 0000010000011	J8510
7269	NSLL 170.	REVERSAL	ANGLE < 218.21 DEG	S	260000242	01011 000000000 0000010000010	J8510
7270	NSLL 171.	REVERSAL	ANGLE < 219.60 DEG	S	260000243	01011 000000000 0000010000011	J8510
7271	NSLL 172.	REVERSAL	ANGLE < 221.00 DEG	S	260000244	01011 000000000 0000010000010	J8510
7272	NSLL 173.	REVERSAL	ANGLE < 222.40 DEG	S	260000245	01011 000000000 0000010000011	J8510
7273	NSLL 174.	REVERSAL	ANGLE < 223.79 DEG	S	260000246	01011 000000000 0000010000010	J8510
7274	NSLL 175.	REVERSAL	ANGLE < 225.19 DEG	S	260000247	01011 000000000 0000010000011	J8510
7275	NSLL 176.	REVERSAL	ANGLE < 226.58 DEG	S	260000248	01011 000000000 0000010000010	J8510
7276	NSLL 177.	REVERSAL	ANGLE < 227.98 DEG	S	260000249	01011 000000000 0000010000011	J8510
7277	NSLL 178.	REVERSAL	ANGLE < 229.37 DEG	S	260000250	01011 000000000 0000010000010	J8510
7278	NSLL 179.	REVERSAL	ANGLE < 230.77 DEG	S	260000251	01011 000000000 0000010000011	J8510

P78-2 COMMAND LIST 08-18-78 REV ? STATE = (PULSE(P), LATCHING(L), UNLATCHING(U), MOMENTARY(M), SERIAL(S), NON-REDUNDANT RELAY(R))
SC9 EXPERIMENT ***** TEST LIST : NO PARITY *****

S CMD NO.	NAME	STATE	DATA	BINARY BITS 6-32	T4 VERIFICATION AND REFERENCE
7279	NSLL 180, REVERSAL ANGLE < 232.16 DEG	S	260000284	01011 00000000 0000010110100	J8310
7280	NSLL 0, FORCED REVERSAL ANGLE	S	260000000	01011 00000000 0000000000000	J8310
7281	NSLL 255, FORCED REVERSAL ANGLE	S	260000377	01011 00000000 0000111111111	J8310
7282	NSUL 1, REVERSAL ANGLE > -17.60 DEG	S	260000401	01011 00000000 0000100000001	J8311
7283	NSUL 2, REVERSAL ANGLE > -16.21 DEG	S	260000402	01011 00000000 0000100000010	J8311
7284	NSUL 3, REVERSAL ANGLE > -14.81 DEG	S	260000403	01011 00000000 0000100000011	J8311
7285	NSUL 4, REVERSAL ANGLE > -13.42 DEG	S	260000404	01011 00000000 0000100000010	J8311
7286	NSUL 5, REVERSAL ANGLE > -12.02 DEG	S	260000405	01011 00000000 0000100000010	J8311
7287	NSUL 6, REVERSAL ANGLE > -10.63 DEG	S	260000406	01011 00000000 0000100000010	J8311
7288	NSUL 7, REVERSAL ANGLE > -9.23 DEG	S	260000407	01011 00000000 0000100000011	J8311
7289	NSUL 8, REVERSAL ANGLE > -7.84 DEG	S	260000410	01011 00000000 0000100000010	J8311
7290	NSUL 9, REVERSAL ANGLE > -6.44 DEG	S	260000411	01011 00000000 0000100000010	J8311
7291	NSUL 10, REVERSAL ANGLE > -5.05 DEG	S	260000412	01011 00000000 0000100000010	J8311
7292	NSUL 11, REVERSAL ANGLE > -3.65 DEG	S	260000413	01011 00000000 0000100000011	J8311
7293	NSUL 12, REVERSAL ANGLE > -2.26 DEG	S	260000414	01011 00000000 0000100000010	J8311
7294	NSUL 13, REVERSAL ANGLE > -0.86 DEG	S	260000415	01011 00000000 0000100000010	J8311
7295	NSUL 14, REVERSAL ANGLE > 0.53 DEG	S	260000416	01011 00000000 0000100000011	J8311
7296	NSUL 15, REVERSAL ANGLE > 1.93 DEG	S	260000417	01011 00000000 0000100000011	J8311
7297	NSUL 16, REVERSAL ANGLE > 3.33 DEG	S	260000420	01011 00000000 0000100000010	J8311
7298	NSUL 17, REVERSAL ANGLE > 4.72 DEG	S	260000421	01011 00000000 0000100000010	J8311
7299	NSUL 18, REVERSAL ANGLE > 6.12 DEG	S	260000422	01011 00000000 0000100000010	J8311
7300	NSUL 19, REVERSAL ANGLE > 7.51 DEG	S	260000423	01011 00000000 0000100000011	J8311
7301	NSUL 20, REVERSAL ANGLE > 8.91 DEG	S	260000424	01011 00000000 0000100000010	J8311
7302	NSUL 21, REVERSAL ANGLE > 10.30 DEG	S	260000425	01011 00000000 0000100000010	J8311
7303	NSUL 22, REVERSAL ANGLE > 11.70 DEG	S	260000426	01011 00000000 0000100000010	J8311
7304	NSUL 23, REVERSAL ANGLE > 13.09 DEG	S	260000427	01011 00000000 0000100000011	J8311
7305	NSUL 24, REVERSAL ANGLE > 14.49 DEG	S	260000430	01011 00000000 0000100000010	J8311
7306	NSUL 25, REVERSAL ANGLE > 15.88 DEG	S	260000431	01011 00000000 0000100000010	J8311
7307	NSUL 26, REVERSAL ANGLE > 17.28 DEG	S	260000432	01011 00000000 0000100000010	J8311
7308	NSUL 27, REVERSAL ANGLE > 18.67 DEG	S	260000433	01011 00000000 0000100000011	J8311
7309	NSUL 28, REVERSAL ANGLE > 20.07 DEG	S	260000434	01011 00000000 0000100000010	J8311
7310	NSUL 29, REVERSAL ANGLE > 21.47 DEG	S	260000435	01011 00000000 0000100000010	J8311
7311	NSUL 30, REVERSAL ANGLE > 22.86 DEG	S	260000436	01011 00000000 0000100000011	J8311
7312	NSUL 31, REVERSAL ANGLE > 24.26 DEG	S	260000437	01011 00000000 0000100000011	J8311
7313	NSUL 32, REVERSAL ANGLE > 25.65 DEG	S	260000440	01011 00000000 0000100000010	J8311
7314	NSUL 33, REVERSAL ANGLE > 27.05 DEG	S	260000441	01011 00000000 0000100000010	J8311
7315	NSUL 34, REVERSAL ANGLE > 28.44 DEG	S	260000442	01011 00000000 0000100000010	J8311
7316	NSUL 35, REVERSAL ANGLE > 29.84 DEG	S	260000443	01011 00000000 0000100000011	J8311
7317	NSUL 36, REVERSAL ANGLE > 31.23 DEG	S	260000444	01011 00000000 0000100000010	J8311
7318	NSUL 37, REVERSAL ANGLE > 32.63 DEG	S	260000445	01011 00000000 0000100000010	J8311
7319	NSUL 38, REVERSAL ANGLE > 34.02 DEG	S	260000446	01011 00000000 0000100000010	J8311
7320	NSUL 39, REVERSAL ANGLE > 35.42 DEG	S	260000447	01011 00000000 0000100000011	J8311
7321	NSUL 40, REVERSAL ANGLE > 36.81 DEG	S	260000450	01011 00000000 0000100000010	J8311
7322	NSUL 41, REVERSAL ANGLE > 38.21 DEG	S	260000451	01011 00000000 0000100000010	J8311
7323	NSUL 42, REVERSAL ANGLE > 39.60 DEG	S	260000452	01011 00000000 0000100000010	J8311
7324	NSUL 43, REVERSAL ANGLE > 41.00 DEG	S	260000453	01011 00000000 0000100000010	J8311
7325	NSUL 44, REVERSAL ANGLE > 42.40 DEG	S	260000454	01011 00000000 0000100000010	J8311
7326	NSUL 45, REVERSAL ANGLE > 43.79 DEG	S	260000455	01011 00000000 0000100000010	J8311
7327	NSUL 46, REVERSAL ANGLE > 45.19 DEG	S	260000456	01011 00000000 0000100000010	J8311
7328	NSUL 47, REVERSAL ANGLE > 46.58 DEG	S	260000457	01011 00000000 0000100000011	J8311

AD-A129 297

HANDBOOK FOR UCSD SC9 SCATHA AURORAL PARTICLES
EXPERIMENT(U) CALIFORNIA UNIV SAN DIEGO LA JOLLA SPACE
PHYSICS LAB S DEFOREST ET AL. AUG 80 F04701-77-C-0062

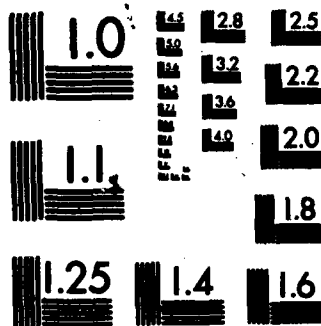
3/3

UNCLASSIFIED

F/G 22/1

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								DATE						
								FORMED						
								DTIC						



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

P70-2 COMMAND LIST 08-18-78 REV ? STATE = (PULSE(P), LATCHING(L), UNLATCHING(U), MOMENTARY(M), SERIAL(S), NON-REDUNDANT RELAY(R))
SC9 EXPERIMENT ***** TEST LIST : NO PARITY *****

S-CMD NO.	NAME	REVERSAL	ANGLE	STATE	CTCL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
7329	NSUL 48,	REVERSAL	ANGLE > 47.98 DEG	S	260000360	01011 00000000 0000100110000	J8511
7330	NSUL 49,	REVERSAL	ANGLE > 49.37 DEG	S	260000361	01011 00000000 0000100110001	J8511
7331	NSUL 50,	REVERSAL	ANGLE > 50.77 DEG	S	260000362	01011 00000000 0000100110010	J8511
7332	NSUL 51,	REVERSAL	ANGLE > 52.16 DEG	S	260000363	01011 00000000 0000100110011	J8511
7333	NSUL 52,	REVERSAL	ANGLE > 53.55 DEG	S	260000364	01011 00000000 0000100110100	J8511
7334	NSUL 53,	REVERSAL	ANGLE > 54.95 DEG	S	260000365	01011 00000000 0000100110101	J8511
7335	NSUL 54,	REVERSAL	ANGLE > 56.35 DEG	S	260000366	01011 00000000 0000100110110	J8511
7336	NSUL 55,	REVERSAL	ANGLE > 57.74 DEG	S	260000367	01011 00000000 0000100110111	J8511
7337	NSUL 56,	REVERSAL	ANGLE > 59.14 DEG	S	260000368	01011 00000000 0000100110100	J8511
7338	NSUL 57,	REVERSAL	ANGLE > 60.53 DEG	S	260000369	01011 00000000 0000100110101	J8511
7339	NSUL 58,	REVERSAL	ANGLE > 61.93 DEG	S	260000370	01011 00000000 0000100110100	J8511
7340	NSUL 59,	REVERSAL	ANGLE > 63.33 DEG	S	260000371	01011 00000000 0000100110101	J8511
7341	NSUL 60,	REVERSAL	ANGLE > 64.72 DEG	S	260000372	01011 00000000 0000100110100	J8511
7342	NSUL 61,	REVERSAL	ANGLE > 66.12 DEG	S	260000373	01011 00000000 0000100110101	J8511
7343	NSUL 62,	REVERSAL	ANGLE > 67.51 DEG	S	260000374	01011 00000000 0000100110110	J8511
7344	NSUL 63,	REVERSAL	ANGLE > 68.91 DEG	S	260000375	01011 00000000 0000100110111	J8511
7345	NSUL 64,	REVERSAL	ANGLE > 70.30 DEG	S	260000376	01011 00000000 0000100110000	J8511
7346	NSUL 65,	REVERSAL	ANGLE > 71.70 DEG	S	260000377	01011 00000000 0000100110001	J8511
7347	NSUL 66,	REVERSAL	ANGLE > 73.09 DEG	S	260000378	01011 00000000 0000100110000	J8511
7348	NSUL 67,	REVERSAL	ANGLE > 74.49 DEG	S	260000379	01011 00000000 0000100110001	J8511
7349	NSUL 68,	REVERSAL	ANGLE > 75.88 DEG	S	260000380	01011 00000000 0000100110000	J8511
7350	NSUL 69,	REVERSAL	ANGLE > 77.28 DEG	S	260000381	01011 00000000 0000100110001	J8511
7351	NSUL 70,	REVERSAL	ANGLE > 78.67 DEG	S	260000382	01011 00000000 0000100110000	J8511
7352	NSUL 71,	REVERSAL	ANGLE > 80.07 DEG	S	260000383	01011 00000000 0000100110001	J8511
7353	NSUL 72,	REVERSAL	ANGLE > 81.47 DEG	S	260000384	01011 00000000 0000100110000	J8511
7354	NSUL 73,	REVERSAL	ANGLE > 82.86 DEG	S	260000385	01011 00000000 0000100110001	J8511
7355	NSUL 74,	REVERSAL	ANGLE > 84.26 DEG	S	260000386	01011 00000000 0000100110000	J8511
7356	NSUL 75,	REVERSAL	ANGLE > 85.65 DEG	S	260000387	01011 00000000 0000100110001	J8511
7357	NSUL 76,	REVERSAL	ANGLE > 87.05 DEG	S	260000388	01011 00000000 0000100110000	J8511
7358	NSUL 77,	REVERSAL	ANGLE > 88.44 DEG	S	260000389	01011 00000000 0000100110001	J8511
7359	NSUL 78,	REVERSAL	ANGLE > 89.84 DEG	S	260000390	01011 00000000 0000100110000	J8511
7360	NSUL 79,	REVERSAL	ANGLE > 91.23 DEG	S	260000391	01011 00000000 0000100110001	J8511
7361	NSUL 80,	REVERSAL	ANGLE > 92.63 DEG	S	260000392	01011 00000000 0000100110000	J8511
7362	NSUL 81,	REVERSAL	ANGLE > 94.02 DEG	S	260000393	01011 00000000 0000100110001	J8511
7363	NSUL 82,	REVERSAL	ANGLE > 95.42 DEG	S	260000394	01011 00000000 0000100110000	J8511
7364	NSUL 83,	REVERSAL	ANGLE > 96.81 DEG	S	260000395	01011 00000000 0000100110001	J8511
7365	NSUL 84,	REVERSAL	ANGLE > 98.21 DEG	S	260000396	01011 00000000 0000100110000	J8511
7366	NSUL 85,	REVERSAL	ANGLE > 99.60 DEG	S	260000397	01011 00000000 0000100110001	J8511
7367	NSUL 86,	REVERSAL	ANGLE > 101.00 DEG	S	260000398	01011 00000000 0000100110000	J8511
7368	NSUL 87,	REVERSAL	ANGLE > 102.40 DEG	S	260000399	01011 00000000 0000100110001	J8511
7369	NSUL 88,	REVERSAL	ANGLE > 103.79 DEG	S	260000400	01011 00000000 0000100110000	J8511
7370	NSUL 89,	REVERSAL	ANGLE > 105.19 DEG	S	260000401	01011 00000000 0000100110001	J8511
7371	NSUL 90,	REVERSAL	ANGLE > 106.58 DEG	S	260000402	01011 00000000 0000100110000	J8511
7372	NSUL 91,	REVERSAL	ANGLE > 107.98 DEG	S	260000403	01011 00000000 0000100110001	J8511
7373	NSUL 92,	REVERSAL	ANGLE > 109.37 DEG	S	260000404	01011 00000000 0000100110000	J8511
7374	NSUL 93,	REVERSAL	ANGLE > 110.77 DEG	S	260000405	01011 00000000 0000100110001	J8511
7375	NSUL 94,	REVERSAL	ANGLE > 112.16 DEG	S	260000406	01011 00000000 0000100110000	J8511
7376	NSUL 95,	REVERSAL	ANGLE > 113.56 DEG	S	260000407	01011 00000000 0000100110001	J8511
7377	NSUL 96,	REVERSAL	ANGLE > 114.95 DEG	S	260000408	01011 00000000 0000100110000	J8511
7378	NSUL 97,	REVERSAL	ANGLE > 116.35 DEG	S	260000409	01011 00000000 0000100110001	J8511

P78-2 COMMAND LIST 08-18-78 REV ? STATE = (PULSE(P), LATCHING(L), UNLATCHING(U), MOMENTARY(M), SERIAL(S), NON-REDUNDANT RELAY(R))
SC9 EXPERIMENT ***** TEST LIST : NO PARITY *****

S	CHD NO.	NAME	REVERSAL ANGLE >	STATE	CTCL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
7379	NSUL 98	REVERSAL ANGLE >	117.74 DEG	S	26000052	01011 00000000 00001011000010	J6511
7380	NSUL 99	REVERSAL ANGLE >	119.14 DEG	S	26000053	01011 00000000 00001011000011	J6511
7381	NSUL 100	REVERSAL ANGLE >	120.53 DEG	S	26000054	01011 00000000 00001011000011	J6511
7382	NSUL 101	REVERSAL ANGLE >	121.93 DEG	S	26000055	01011 00000000 00001011000011	J6511
7383	NSUL 102	REVERSAL ANGLE >	123.33 DEG	S	26000056	01011 00000000 00001011000011	J6511
7384	NSUL 103	REVERSAL ANGLE >	124.72 DEG	S	26000057	01011 00000000 00001011000011	J6511
7385	NSUL 104	REVERSAL ANGLE >	126.12 DEG	S	26000058	01011 00000000 00001011000011	J6511
7386	NSUL 105	REVERSAL ANGLE >	127.51 DEG	S	26000059	01011 00000000 00001011000011	J6511
7387	NSUL 106	REVERSAL ANGLE >	128.91 DEG	S	26000060	01011 00000000 00001011000011	J6511
7388	NSUL 107	REVERSAL ANGLE >	130.30 DEG	S	26000061	01011 00000000 00001011000011	J6511
7389	NSUL 108	REVERSAL ANGLE >	131.70 DEG	S	26000062	01011 00000000 00001011000011	J6511
7390	NSUL 109	REVERSAL ANGLE >	133.09 DEG	S	26000063	01011 00000000 00001011000011	J6511
7391	NSUL 110	REVERSAL ANGLE >	134.48 DEG	S	26000064	01011 00000000 00001011000011	J6511
7392	NSUL 111	REVERSAL ANGLE >	135.88 DEG	S	26000065	01011 00000000 00001011000011	J6511
7393	NSUL 112	REVERSAL ANGLE >	137.28 DEG	S	26000066	01011 00000000 00001011000011	J6511
7394	NSUL 113	REVERSAL ANGLE >	138.67 DEG	S	26000067	01011 00000000 00001011000011	J6511
7395	NSUL 114	REVERSAL ANGLE >	140.07 DEG	S	26000068	01011 00000000 00001011000011	J6511
7396	NSUL 115	REVERSAL ANGLE >	141.47 DEG	S	26000069	01011 00000000 00001011000011	J6511
7397	NSUL 116	REVERSAL ANGLE >	142.86 DEG	S	26000070	01011 00000000 00001011000011	J6511
7398	NSUL 117	REVERSAL ANGLE >	144.26 DEG	S	26000071	01011 00000000 00001011000011	J6511
7399	NSUL 118	REVERSAL ANGLE >	145.65 DEG	S	26000072	01011 00000000 00001011000011	J6511
7400	NSUL 119	REVERSAL ANGLE >	147.05 DEG	S	26000073	01011 00000000 00001011000011	J6511
7401	NSUL 120	REVERSAL ANGLE >	148.44 DEG	S	26000074	01011 00000000 00001011000011	J6511
7402	NSUL 121	REVERSAL ANGLE >	149.84 DEG	S	26000075	01011 00000000 00001011000011	J6511
7403	NSUL 122	REVERSAL ANGLE >	151.23 DEG	S	26000076	01011 00000000 00001011000011	J6511
7404	NSUL 123	REVERSAL ANGLE >	152.63 DEG	S	26000077	01011 00000000 00001011000011	J6511
7405	NSUL 124	REVERSAL ANGLE >	154.02 DEG	S	26000078	01011 00000000 00001011000011	J6511
7406	NSUL 125	REVERSAL ANGLE >	155.42 DEG	S	26000079	01011 00000000 00001011000011	J6511
7407	NSUL 126	REVERSAL ANGLE >	156.81 DEG	S	26000080	01011 00000000 00001011000011	J6511
7408	NSUL 127	REVERSAL ANGLE >	158.21 DEG	S	26000081	01011 00000000 00001011000011	J6511
7409	NSUL 128	REVERSAL ANGLE >	159.60 DEG	S	26000082	01011 00000000 00001011000011	J6511
7410	NSUL 129	REVERSAL ANGLE >	161.00 DEG	S	26000083	01011 00000000 00001011000011	J6511
7411	NSUL 130	REVERSAL ANGLE >	162.40 DEG	S	26000084	01011 00000000 00001011000011	J6511
7412	NSUL 131	REVERSAL ANGLE >	163.79 DEG	S	26000085	01011 00000000 00001011000011	J6511
7413	NSUL 132	REVERSAL ANGLE >	165.19 DEG	S	26000086	01011 00000000 00001011000011	J6511
7414	NSUL 133	REVERSAL ANGLE >	166.58 DEG	S	26000087	01011 00000000 00001011000011	J6511
7415	NSUL 134	REVERSAL ANGLE >	167.97 DEG	S	26000088	01011 00000000 00001011000011	J6511
7416	NSUL 135	REVERSAL ANGLE >	169.37 DEG	S	26000089	01011 00000000 00001011000011	J6511
7417	NSUL 136	REVERSAL ANGLE >	170.77 DEG	S	26000090	01011 00000000 00001011000011	J6511
7418	NSUL 137	REVERSAL ANGLE >	172.16 DEG	S	26000091	01011 00000000 00001011000011	J6511
7419	NSUL 138	REVERSAL ANGLE >	173.56 DEG	S	26000092	01011 00000000 00001011000011	J6511
7420	NSUL 139	REVERSAL ANGLE >	174.95 DEG	S	26000093	01011 00000000 00001011000011	J6511
7421	NSUL 140	REVERSAL ANGLE >	176.35 DEG	S	26000094	01011 00000000 00001011000011	J6511
7422	NSUL 141	REVERSAL ANGLE >	177.74 DEG	S	26000095	01011 00000000 00001011000011	J6511
7423	NSUL 142	REVERSAL ANGLE >	179.14 DEG	S	26000096	01011 00000000 00001011000011	J6511
7424	NSUL 143	REVERSAL ANGLE >	180.53 DEG	S	26000097	01011 00000000 00001011000011	J6511
7425	NSUL 144	REVERSAL ANGLE >	181.93 DEG	S	26000098	01011 00000000 00001011000011	J6511
7426	NSUL 145	REVERSAL ANGLE >	183.33 DEG	S	26000099	01011 00000000 00001011000011	J6511
7427	NSUL 146	REVERSAL ANGLE >	184.72 DEG	S	26000100	01011 00000000 00001011000011	J6511
7428	NSUL 147	REVERSAL ANGLE >	186.12 DEG	S	26000101	01011 00000000 00001011000011	J6511

P78-2 COMMAND LIST 08-18-78 REV ?
SC9 EXPERIMENT

STATE = (PULSE(P), LATCHING(L), UNLATCHING(U), MOMENTARY(M), SERIAL(S), NON-REDUNDANT RELAY(R))
***** TEST LIST : NO PARITY *****

S CMD NO.	NAME	REVERSAL ANGLE	STATE	OCTAL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
7420	NSUL 148,	REVERSAL ANGLE > 187.51 DEG	S	260000624	01011 000000000 0000110010100	J8511
7430	NSUL 149,	REVERSAL ANGLE > 188.91 DEG	S	260000625	01011 000000000 0000110010101	J8511
7431	NSUL 150,	REVERSAL ANGLE > 190.30 DEG	S	260000626	01011 000000000 0000110010110	J8511
7432	NSUL 151,	REVERSAL ANGLE > 191.70 DEG	S	260000627	01011 000000000 0000110010111	J8511
7433	NSUL 152,	REVERSAL ANGLE > 193.09 DEG	S	260000630	01011 000000000 0000110011000	J8511
7434	NSUL 153,	REVERSAL ANGLE > 194.49 DEG	S	260000631	01011 000000000 0000110011001	J8511
7435	NSUL 154,	REVERSAL ANGLE > 195.88 DEG	S	260000632	01011 000000000 0000110011010	J8511
7436	NSUL 155,	REVERSAL ANGLE > 197.28 DEG	S	260000633	01011 000000000 0000110011011	J8511
7437	NSUL 156,	REVERSAL ANGLE > 198.67 DEG	S	260000634	01011 000000000 0000110011010	J8511
7438	NSUL 157,	REVERSAL ANGLE > 200.07 DEG	S	260000635	01011 000000000 0000110011011	J8511
7439	NSUL 158,	REVERSAL ANGLE > 201.47 DEG	S	260000636	01011 000000000 0000110011010	J8511
7440	NSUL 159,	REVERSAL ANGLE > 202.86 DEG	S	260000637	01011 000000000 0000110011011	J8511
7441	NSUL 160,	REVERSAL ANGLE > 204.26 DEG	S	260000640	01011 000000000 0000110100000	J8511
7442	NSUL 161,	REVERSAL ANGLE > 205.65 DEG	S	260000641	01011 000000000 0000110100001	J8511
7443	NSUL 162,	REVERSAL ANGLE > 207.05 DEG	S	260000642	01011 000000000 0000110100010	J8511
7444	NSUL 163,	REVERSAL ANGLE > 208.44 DEG	S	260000643	01011 000000000 0000110100011	J8511
7445	NSUL 164,	REVERSAL ANGLE > 209.84 DEG	S	260000644	01011 000000000 0000110100010	J8511
7446	NSUL 165,	REVERSAL ANGLE > 211.23 DEG	S	260000645	01011 000000000 0000110100011	J8511
7447	NSUL 166,	REVERSAL ANGLE > 212.62 DEG	S	260000646	01011 000000000 0000110100010	J8511
7448	NSUL 167,	REVERSAL ANGLE > 214.02 DEG	S	260000647	01011 000000000 0000110100011	J8511
7449	NSUL 168,	REVERSAL ANGLE > 215.42 DEG	S	260000650	01011 000000000 0000110101000	J8511
7450	NSUL 169,	REVERSAL ANGLE > 216.81 DEG	S	260000651	01011 000000000 0000110101001	J8511
7451	NSUL 170,	REVERSAL ANGLE > 218.21 DEG	S	260000652	01011 000000000 0000110101010	J8511
7452	NSUL 171,	REVERSAL ANGLE > 219.60 DEG	S	260000653	01011 000000000 0000110101011	J8511
7453	NSUL 172,	REVERSAL ANGLE > 221.00 DEG	S	260000654	01011 000000000 0000110101010	J8511
7454	NSUL 173,	REVERSAL ANGLE > 222.40 DEG	S	260000655	01011 000000000 0000110101011	J8511
7455	NSUL 174,	REVERSAL ANGLE > 223.79 DEG	S	260000656	01011 000000000 0000110101010	J8511
7456	NSUL 175,	REVERSAL ANGLE > 225.19 DEG	S	260000657	01011 000000000 0000110101011	J8511
7457	NSUL 176,	REVERSAL ANGLE > 226.58 DEG	S	260000660	01011 000000000 0000110101000	J8511
7458	NSUL 177,	REVERSAL ANGLE > 227.98 DEG	S	260000661	01011 000000000 0000110101001	J8511
7459	NSUL 178,	REVERSAL ANGLE > 229.37 DEG	S	260000662	01011 000000000 0000110101010	J8511
7460	NSUL 179,	REVERSAL ANGLE > 230.77 DEG	S	260000663	01011 000000000 0000110101011	J8511
7461	NSUL 180,	REVERSAL ANGLE > 232.16 DEG	S	260000664	01011 000000000 0000110101010	J8511
7462	NSUL 0,	FORCED REVERSAL ANGLE	S	260000420	01011 000000000 0000100000000	J8511
7463	NSUL 255,	FORCED REVERSAL ANGLE	S	260000777	01011 000000000 0000111111111	J8511
7464	EWLL 1,	REVERSAL ANGLE < -17.60 DEG	S	260001001	01011 000000000 0001000000001	J8512
7465	EWLL 2,	REVERSAL ANGLE < -16.21 DEG	S	260001002	01011 000000000 0001000000010	J8512
7466	EWLL 3,	REVERSAL ANGLE < -14.81 DEG	S	260001003	01011 000000000 0001000000011	J8512
7467	EWLL 4,	REVERSAL ANGLE < -13.42 DEG	S	260001004	01011 000000000 0001000000010	J8512
7468	EWLL 5,	REVERSAL ANGLE < -12.02 DEG	S	260001005	01011 000000000 0001000000011	J8512
7469	EWLL 6,	REVERSAL ANGLE < -10.63 DEG	S	260001006	01011 000000000 0001000000010	J8512
7470	EWLL 7,	REVERSAL ANGLE < -9.23 DEG	S	260001007	01011 000000000 0001000000011	J8512
7471	EWLL 8,	REVERSAL ANGLE < -7.84 DEG	S	260001010	01011 000000000 0001000000010	J8512
7472	EWLL 9,	REVERSAL ANGLE < -6.44 DEG	S	260001011	01011 000000000 0001000000011	J8512
7473	EWLL 10,	REVERSAL ANGLE < -5.05 DEG	S	260001012	01011 000000000 0001000000010	J8512
7474	EWLL 11,	REVERSAL ANGLE < -3.65 DEG	S	260001013	01011 000000000 0001000000011	J8512
7475	EWLL 12,	REVERSAL ANGLE < -2.26 DEG	S	260001014	01011 000000000 0001000000010	J8512
7476	EWLL 13,	REVERSAL ANGLE < -0.86 DEG	S	260001015	01011 000000000 0001000000011	J8512
7477	EWLL 14,	REVERSAL ANGLE < 0.53 DEG	S	260001016	01011 000000000 0001000000010	J8512
7478	EWLL 15,	REVERSAL ANGLE < 1.93 DEG	S	260001017	01011 000000000 0001000000011	J8512

S	CMD NO.	NAME	REVERSAL	ANGLE	STATE	OCIAL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
7479	EWLL 16.	REVERSAL	ANGLE < 3.33 DEG	S	260001020	01011	000000000	0001000010000 J8512
7480	EWLL 17.	REVERSAL	ANGLE < 4.72 DEG	S	260001021	01011	000000000	0001000010001 J8512
7481	EWLL 18.	REVERSAL	ANGLE < 6.12 DEG	S	260001022	01011	000000000	0001000010010 J8512
7482	EWLL 19.	REVERSAL	ANGLE < 7.51 DEG	S	260001023	01011	000000000	0001000010011 J8512
7483	EWLL 20.	REVERSAL	ANGLE < 8.91 DEG	S	260001024	01011	000000000	0001000010010 J8512
7484	EWLL 21.	REVERSAL	ANGLE < 10.30 DEG	S	260001025	01011	000000000	0001000010010 J8512
7485	EWLL 22.	REVERSAL	ANGLE < 11.70 DEG	S	260001026	01011	000000000	0001000010010 J8512
7486	EWLL 23.	REVERSAL	ANGLE < 13.09 DEG	S	260001027	01011	000000000	0001000010011 J8512
7487	EWLL 24.	REVERSAL	ANGLE < 14.49 DEG	S	260001030	01011	000000000	0001000010000 J8512
7488	EWLL 25.	REVERSAL	ANGLE < 15.88 DEG	S	260001031	01011	000000000	0001000010001 J8512
7489	EWLL 26.	REVERSAL	ANGLE < 17.28 DEG	S	260001032	01011	000000000	0001000010010 J8512
7490	EWLL 27.	REVERSAL	ANGLE < 18.67 DEG	S	260001033	01011	000000000	0001000010011 J8512
7491	EWLL 28.	REVERSAL	ANGLE < 20.07 DEG	S	260001034	01011	000000000	0001000010011 J8512
7492	EWLL 29.	REVERSAL	ANGLE < 21.47 DEG	S	260001035	01011	000000000	0001000010011 J8512
7493	EWLL 30.	REVERSAL	ANGLE < 22.86 DEG	S	260001036	01011	000000000	0001000010011 J8512
7494	EWLL 31.	REVERSAL	ANGLE < 24.26 DEG	S	260001037	01011	000000000	0001000010011 J8512
7495	EWLL 32.	REVERSAL	ANGLE < 25.65 DEG	S	260001040	01011	000000000	0001000010000 J8512
7496	EWLL 33.	REVERSAL	ANGLE < 27.05 DEG	S	260001041	01011	000000000	0001000010001 J8512
7497	EWLL 34.	REVERSAL	ANGLE < 28.44 DEG	S	260001042	01011	000000000	0001000010010 J8512
7498	EWLL 35.	REVERSAL	ANGLE < 29.84 DEG	S	260001043	01011	000000000	0001000010011 J8512
7499	EWLL 36.	REVERSAL	ANGLE < 31.23 DEG	S	260001044	01011	000000000	0001000010010 J8512
7500	EWLL 37.	REVERSAL	ANGLE < 32.63 DEG	S	260001045	01011	000000000	0001000010010 J8512
7501	EWLL 38.	REVERSAL	ANGLE < 34.02 DEG	S	260001046	01011	000000000	0001000010011 J8512
7502	EWLL 39.	REVERSAL	ANGLE < 35.42 DEG	S	260001047	01011	000000000	0001000010011 J8512
7503	EWLL 40.	REVERSAL	ANGLE < 36.81 DEG	S	260001050	01011	000000000	0001000010000 J8512
7504	EWLL 41.	REVERSAL	ANGLE < 38.21 DEG	S	260001051	01011	000000000	0001000010001 J8512
7505	EWLL 42.	REVERSAL	ANGLE < 39.60 DEG	S	260001052	01011	000000000	0001000010010 J8512
7506	EWLL 43.	REVERSAL	ANGLE < 41.00 DEG	S	260001053	01011	000000000	0001000010011 J8512
7507	EWLL 44.	REVERSAL	ANGLE < 42.40 DEG	S	260001054	01011	000000000	0001000010010 J8512
7508	EWLL 45.	REVERSAL	ANGLE < 43.79 DEG	S	260001055	01011	000000000	0001000010011 J8512
7509	EWLL 46.	REVERSAL	ANGLE < 45.19 DEG	S	260001056	01011	000000000	0001000010011 J8512
7510	EWLL 47.	REVERSAL	ANGLE < 46.58 DEG	S	260001057	01011	000000000	0001000010011 J8512
7511	EWLL 48.	REVERSAL	ANGLE < 47.98 DEG	S	260001060	01011	000000000	0001000010000 J8512
7512	EWLL 49.	REVERSAL	ANGLE < 49.37 DEG	S	260001061	01011	000000000	0001000010001 J8512
7513	EWLL 50.	REVERSAL	ANGLE < 50.77 DEG	S	260001062	01011	000000000	0001000010001 J8512
7514	EWLL 51.	REVERSAL	ANGLE < 52.16 DEG	S	260001063	01011	000000000	0001000010011 J8512
7515	EWLL 52.	REVERSAL	ANGLE < 53.56 DEG	S	260001064	01011	000000000	0001000010010 J8512
7516	EWLL 53.	REVERSAL	ANGLE < 54.95 DEG	S	260001065	01011	000000000	0001000010010 J8512
7517	EWLL 54.	REVERSAL	ANGLE < 56.35 DEG	S	260001066	01011	000000000	0001000010010 J8512
7518	EWLL 55.	REVERSAL	ANGLE < 57.74 DEG	S	260001067	01011	000000000	0001000010011 J8512
7519	EWLL 56.	REVERSAL	ANGLE < 59.14 DEG	S	260001070	01011	000000000	0001000010000 J8512
7520	EWLL 57.	REVERSAL	ANGLE < 60.53 DEG	S	260001071	01011	000000000	0001000010001 J8512
7521	EWLL 58.	REVERSAL	ANGLE < 61.93 DEG	S	260001072	01011	000000000	0001000010010 J8512
7522	EWLL 59.	REVERSAL	ANGLE < 63.33 DEG	S	260001073	01011	000000000	0001000010011 J8512
7523	EWLL 60.	REVERSAL	ANGLE < 64.72 DEG	S	260001074	01011	000000000	0001000010010 J8512
7524	EWLL 61.	REVERSAL	ANGLE < 66.12 DEG	S	260001075	01011	000000000	0001000010011 J8512
7525	EWLL 62.	REVERSAL	ANGLE < 67.51 DEG	S	260001076	01011	000000000	0001000010011 J8512
7526	EWLL 63.	REVERSAL	ANGLE < 68.91 DEG	S	260001077	01011	000000000	0001000010011 J8512
7527	EWLL 64.	REVERSAL	ANGLE < 70.30 DEG	S	260001100	01011	000000000	0001000010000 J8512
7528	EWLL 65.	REVERSAL	ANGLE < 71.70 DEG	S	260001101	01011	000000000	0001000010001 J8512

P78-2 COMMAND LIST 08-18-78 REV ? STATE * (PULSE(P), LATCHING(L), UNLATCHING(U), MOMENTARY(M), SERIAL(S), NON-REDUNDANT RELAY(R))
SC9 EXPERIMENT ***** TEST LIST : NO PARITY *****

S	CHD NO.	NAME	REVERSAL	ANGLE	STATE	COTAL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
7529	EWL 66	REVERSAL	ANGLE	< 73.09 DEG	S	260001102	01011 000100000 0001001000010	J6512
7530	EWL 67	REVERSAL	ANGLE	< 74.49 DEG	S	260001103	01011 000000000 0001001000011	J6512
7531	EWL 68	REVERSAL	ANGLE	< 75.89 DEG	S	260001104	01011 000000000 0001001000010	J6512
7532	EWL 69	REVERSAL	ANGLE	< 77.28 DEG	S	260001105	01011 000000000 0001001000010	J6512
7533	EWL 70	REVERSAL	ANGLE	< 78.67 DEG	S	260001106	01011 000000000 0001001000010	J6512
7534	EWL 71	REVERSAL	ANGLE	< 80.07 DEG	S	260001107	01011 000000000 0001001000011	J6512
7535	EWL 72	REVERSAL	ANGLE	< 81.47 DEG	S	260001110	01011 000000000 0001001000010	J6512
7536	EWL 73	REVERSAL	ANGLE	< 82.86 DEG	S	260001111	01011 000000000 0001001000010	J6512
7537	EWL 74	REVERSAL	ANGLE	< 84.26 DEG	S	260001112	01011 000000000 0001001000010	J6512
7538	EWL 75	REVERSAL	ANGLE	< 85.65 DEG	S	260001113	01011 000000000 0001001000011	J6512
7539	EWL 76	REVERSAL	ANGLE	< 87.05 DEG	S	260001114	01011 000000000 0001001000010	J6512
7540	EWL 77	REVERSAL	ANGLE	< 88.44 DEG	S	260001115	01011 000000000 0001001000010	J6512
7541	EWL 78	REVERSAL	ANGLE	< 89.84 DEG	S	260001116	01011 000000000 0001001000011	J6512
7542	EWL 79	REVERSAL	ANGLE	< 91.23 DEG	S	260001117	01011 000000000 0001001000011	J6512
7543	EWL 80	REVERSAL	ANGLE	< 92.63 DEG	S	260001120	01011 000000000 0001001000010	J6512
7544	EWL 81	REVERSAL	ANGLE	< 94.02 DEG	S	260001121	01011 000000000 0001001000010	J6512
7545	EWL 82	REVERSAL	ANGLE	< 95.42 DEG	S	260001122	01011 000000000 0001001000010	J6512
7546	EWL 83	REVERSAL	ANGLE	< 96.81 DEG	S	260001123	01011 000000000 0001001000011	J6512
7547	EWL 84	REVERSAL	ANGLE	< 98.21 DEG	S	260001124	01011 000000000 0001001000010	J6512
7548	EWL 85	REVERSAL	ANGLE	< 99.60 DEG	S	260001125	01011 000000000 0001001000010	J6512
7549	EWL 86	REVERSAL	ANGLE	< 101.00 DEG	S	260001126	01011 000000000 0001001000010	J6512
7550	EWL 87	REVERSAL	ANGLE	< 102.40 DEG	S	260001127	01011 000000000 0001001000011	J6512
7551	EWL 88	REVERSAL	ANGLE	< 103.79 DEG	S	260001130	01011 000000000 0001001000010	J6512
7552	EWL 89	REVERSAL	ANGLE	< 105.19 DEG	S	260001131	01011 000000000 0001001000010	J6512
7553	EWL 90	REVERSAL	ANGLE	< 106.58 DEG	S	260001132	01011 000000000 0001001000010	J6512
7554	EWL 91	REVERSAL	ANGLE	< 107.98 DEG	S	260001133	01011 000000000 0001001000011	J6512
7555	EWL 92	REVERSAL	ANGLE	< 109.37 DEG	S	260001134	01011 000000000 0001001000010	J6512
7556	EWL 93	REVERSAL	ANGLE	< 110.77 DEG	S	260001135	01011 000000000 0001001000010	J6512
7557	EWL 94	REVERSAL	ANGLE	< 112.16 DEG	S	260001136	01011 000000000 0001001000011	J6512
7558	EWL 95	REVERSAL	ANGLE	< 113.55 DEG	S	260001137	01011 000000000 0001001000011	J6512
7559	EWL 96	REVERSAL	ANGLE	< 114.95 DEG	S	260001140	01011 000000000 0001001000010	J6512
7560	EWL 97	REVERSAL	ANGLE	< 116.35 DEG	S	260001141	01011 000000000 0001001000010	J6512
7561	EWL 98	REVERSAL	ANGLE	< 117.74 DEG	S	260001142	01011 000000000 0001001000010	J6512
7562	EWL 99	REVERSAL	ANGLE	< 119.14 DEG	S	260001143	01011 000000000 0001001000011	J6512
7563	EWL 100	REVERSAL	ANGLE	< 120.53 DEG	S	260001144	01011 000000000 0001001000010	J6512
7564	EWL 101	REVERSAL	ANGLE	< 121.93 DEG	S	260001145	01011 000000000 0001001000010	J6512
7565	EWL 102	REVERSAL	ANGLE	< 123.33 DEG	S	260001146	01011 000000000 0001001000010	J6512
7566	EWL 103	REVERSAL	ANGLE	< 124.72 DEG	S	260001147	01011 000000000 0001001000011	J6512
7567	EWL 104	REVERSAL	ANGLE	< 126.12 DEG	S	260001150	01011 000000000 0001001000010	J6512
7568	EWL 105	REVERSAL	ANGLE	< 127.51 DEG	S	260001151	01011 000000000 0001001000010	J6512
7569	EWL 106	REVERSAL	ANGLE	< 128.91 DEG	S	260001152	01011 000000000 0001001000010	J6512
7570	EWL 107	REVERSAL	ANGLE	< 130.30 DEG	S	260001153	01011 000000000 0001001000010	J6512
7571	EWL 108	REVERSAL	ANGLE	< 131.70 DEG	S	260001154	01011 000000000 0001001000010	J6512
7572	EWL 109	REVERSAL	ANGLE	< 133.09 DEG	S	260001155	01011 000000000 0001001000011	J6512
7573	EWL 110	REVERSAL	ANGLE	< 134.49 DEG	S	260001156	01011 000000000 0001001000010	J6512
7574	EWL 111	REVERSAL	ANGLE	< 135.88 DEG	S	260001157	01011 000000000 0001001000011	J6512
7575	EWL 112	REVERSAL	ANGLE	< 137.28 DEG	S	260001160	01011 000000000 0001001000010	J6512
7576	EWL 113	REVERSAL	ANGLE	< 138.67 DEG	S	260001161	01011 000000000 0001001000010	J6512
7577	EWL 114	REVERSAL	ANGLE	< 140.07 DEG	S	260001162	01011 000000000 0001001000010	J6512
7578	EWL 115	REVERSAL	ANGLE	< 141.47 DEG	S	260001163	01011 000000000 0001001000011	J6512

S CMD NO.	NAME	REVERSAL	ANGLE	STATE	OCIAL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
7579	EWLL 116	REVERSAL	ANGLE < 142.86 DEG	S	260001154	01011 00000000 000100110100	J8512
7580	EWLL 117	REVERSAL	ANGLE < 144.26 DEG	S	260001155	01011 00000000 000100110101	J8512
7581	EWLL 118	REVERSAL	ANGLE < 145.65 DEG	S	260001156	01011 00000000 000100110110	J8512
7582	EWLL 119	REVERSAL	ANGLE < 147.05 DEG	S	260001157	01011 00000000 000100110111	J8512
7583	EWLL 120	REVERSAL	ANGLE < 148.44 DEG	S	260001170	01011 00000000 000100111000	J8512
7584	EWLL 121	REVERSAL	ANGLE < 149.84 DEG	S	260001171	01011 00000000 000100111001	J8512
7585	EWLL 122	REVERSAL	ANGLE < 151.23 DEG	S	260001172	01011 00000000 000100111010	J8512
7586	EWLL 123	REVERSAL	ANGLE < 152.63 DEG	S	260001173	01011 00000000 000100111011	J8512
7587	EWLL 124	REVERSAL	ANGLE < 154.02 DEG	S	260001174	01011 00000000 000100111100	J8512
7588	EWLL 125	REVERSAL	ANGLE < 155.42 DEG	S	260001175	01011 00000000 000100111101	J8512
7589	EWLL 126	REVERSAL	ANGLE < 156.81 DEG	S	260001176	01011 00000000 000100111110	J8512
7590	EWLL 127	REVERSAL	ANGLE < 158.21 DEG	S	260001177	01011 00000000 000100111111	J8512
7591	EWLL 128	REVERSAL	ANGLE < 159.60 DEG	S	260001200	01011 00000000 000101000000	J8512
7592	EWLL 129	REVERSAL	ANGLE < 161.00 DEG	S	260001201	01011 00000000 000101000001	J8512
7593	EWLL 130	REVERSAL	ANGLE < 162.40 DEG	S	260001202	01011 00000000 000101000010	J8512
7594	EWLL 131	REVERSAL	ANGLE < 163.79 DEG	S	260001203	01011 00000000 000101000011	J8512
7595	EWLL 132	REVERSAL	ANGLE < 165.19 DEG	S	260001204	01011 00000000 000101000010	J8512
7596	EWLL 133	REVERSAL	ANGLE < 166.58 DEG	S	260001205	01011 00000000 000101000011	J8512
7597	EWLL 134	REVERSAL	ANGLE < 167.98 DEG	S	260001206	01011 00000000 000101000011	J8512
7598	EWLL 135	REVERSAL	ANGLE < 169.37 DEG	S	260001210	01011 00000000 000101000110	J8512
7599	EWLL 136	REVERSAL	ANGLE < 170.77 DEG	S	260001210	01011 00000000 000101000111	J8512
7600	EWLL 137	REVERSAL	ANGLE < 172.16 DEG	S	260001211	01011 00000000 000101000111	J8512
7601	EWLL 138	REVERSAL	ANGLE < 173.56 DEG	S	260001212	01011 00000000 000101000110	J8512
7602	EWLL 139	REVERSAL	ANGLE < 174.95 DEG	S	260001213	01011 00000000 000101000111	J8512
7603	EWLL 140	REVERSAL	ANGLE < 176.35 DEG	S	260001214	01011 00000000 000101000110	J8512
7604	EWLL 141	REVERSAL	ANGLE < 177.74 DEG	S	260001215	01011 00000000 000101000111	J8512
7605	EWLL 142	REVERSAL	ANGLE < 179.14 DEG	S	260001216	01011 00000000 000101000110	J8512
7606	EWLL 143	REVERSAL	ANGLE < 180.53 DEG	S	260001217	01011 00000000 000101000111	J8512
7607	EWLL 144	REVERSAL	ANGLE < 181.93 DEG	S	260001220	01011 00000000 000101000100	J8512
7608	EWLL 145	REVERSAL	ANGLE < 183.33 DEG	S	260001221	01011 00000000 000101000101	J8512
7609	EWLL 146	REVERSAL	ANGLE < 184.72 DEG	S	260001222	01011 00000000 000101000100	J8512
7610	EWLL 147	REVERSAL	ANGLE < 186.12 DEG	S	260001223	01011 00000000 000101000101	J8512
7611	EWLL 148	REVERSAL	ANGLE < 187.51 DEG	S	260001224	01011 00000000 000101000100	J8512
7612	EWLL 149	REVERSAL	ANGLE < 188.91 DEG	S	260001225	01011 00000000 000101000101	J8512
7613	EWLL 150	REVERSAL	ANGLE < 190.30 DEG	S	260001226	01011 00000000 000101000110	J8512
7614	EWLL 151	REVERSAL	ANGLE < 191.70 DEG	S	260001227	01011 00000000 000101000111	J8512
7615	EWLL 152	REVERSAL	ANGLE < 193.09 DEG	S	260001230	01011 00000000 000101000100	J8512
7616	EWLL 153	REVERSAL	ANGLE < 194.49 DEG	S	260001231	01011 00000000 000101000101	J8512
7617	EWLL 154	REVERSAL	ANGLE < 195.89 DEG	S	260001232	01011 00000000 000101000110	J8512
7618	EWLL 155	REVERSAL	ANGLE < 197.28 DEG	S	260001233	01011 00000000 000101000111	J8512
7619	EWLL 156	REVERSAL	ANGLE < 198.67 DEG	S	260001234	01011 00000000 000101000110	J8512
7620	EWLL 157	REVERSAL	ANGLE < 200.07 DEG	S	260001235	01011 00000000 000101000111	J8512
7621	EWLL 158	REVERSAL	ANGLE < 201.47 DEG	S	260001236	01011 00000000 000101000110	J8512
7622	EWLL 159	REVERSAL	ANGLE < 202.86 DEG	S	260001237	01011 00000000 000101000111	J8512
7623	EWLL 160	REVERSAL	ANGLE < 204.26 DEG	S	260001240	01011 00000000 000101000000	J8512
7624	EWLL 161	REVERSAL	ANGLE < 205.65 DEG	S	260001241	01011 00000000 000101000001	J8512
7625	EWLL 162	REVERSAL	ANGLE < 207.05 DEG	S	260001242	01011 00000000 000101000010	J8512
7626	EWLL 163	REVERSAL	ANGLE < 208.44 DEG	S	260001243	01011 00000000 000101000011	J8512
7627	EWLL 164	REVERSAL	ANGLE < 209.84 DEG	S	260001244	01011 00000000 000101000100	J8512
7628	EWLL 165	REVERSAL	ANGLE < 211.23 DEG	S	260001245	01011 00000000 000101000101	J8512

P78-2 COMMAND LIST 08-18-78 REV ?
SC9 EXPERIMENT

STATE = (PULSE(P), LATCHING(L), UNLATCHING(U), MOMENTARY(M), SERIAL(S), NON-REDUNDANT RELAY(R))
***** TEST LIST : NO PARITY *****

S CMD NO.	NAME	REVERSAL ANGLE	STATE	DCIAL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
7629	EWLL 166.	REVERSAL ANGLE < 212.63 DEG	S	260001246	01011 000000000 0001010100110	J8512
7630	EWLL 167.	REVERSAL ANGLE < 214.02 DEG	S	260001247	01011 000000000 0001010100111	J8512
7631	EWLL 168.	REVERSAL ANGLE < 215.42 DEG	S	260001250	01011 000000000 0001010101000	J8512
7632	EWLL 169.	REVERSAL ANGLE < 216.91 DEG	S	260001251	01011 000000000 0001010101001	J8512
7633	EWLL 170.	REVERSAL ANGLE < 218.21 DEG	S	260001252	01011 000000000 0001010101010	J8512
7634	EWLL 171.	REVERSAL ANGLE < 219.60 DEG	S	260001253	01011 000000000 0001010101011	J8512
7635	EWLL 172.	REVERSAL ANGLE < 221.00 DEG	S	260001254	01011 000000000 0001010101100	J8512
7636	EWLL 173.	REVERSAL ANGLE < 222.40 DEG	S	260001255	01011 000000000 0001010101101	J8512
7637	EWLL 174.	REVERSAL ANGLE < 223.79 DEG	S	260001256	01011 000000000 0001010101110	J8512
7638	EWLL 175.	REVERSAL ANGLE < 225.19 DEG	S	260001257	01011 000000000 0001010101111	J8512
7639	EWLL 176.	REVERSAL ANGLE < 226.58 DEG	S	260001260	01011 000000000 0001010110000	J8512
7640	EWLL 177.	REVERSAL ANGLE < 227.98 DEG	S	260001261	01011 000000000 0001010110001	J8512
7641	EWLL 178.	REVERSAL ANGLE < 229.37 DEG	S	260001262	01011 000000000 0001010110010	J8512
7642	EWLL 179.	REVERSAL ANGLE < 230.77 DEG	S	260001263	01011 000000000 0001010110011	J8512
7643	EWLL 180.	REVERSAL ANGLE < 232.16 DEG	S	260001264	01011 000000000 0001010110100	J8512
7644	EWLL 0.	FORCED REVERSAL ANGLE	S	260001030	01011 000000000 0001000000000	J8512
7645	EWLL 255.	FORCED REVERSAL ANGLE	S	260001377	01011 000000000 0001011111111	J8512
7646	EWLL 1.	REVERSAL ANGLE > -17.60 DEG	S	260001401	01011 000000000 0001000000001	J8513
7647	EWLL 2.	REVERSAL ANGLE > -18.21 DEG	S	260001402	01011 000000000 0001000000010	J8513
7648	EWLL 3.	REVERSAL ANGLE > -14.81 DEG	S	260001403	01011 000000000 0001000000011	J8513
7649	EWLL 4.	REVERSAL ANGLE > -13.42 DEG	S	260001404	01011 000000000 0001000000010	J8513
7650	EWLL 5.	REVERSAL ANGLE > -12.02 DEG	S	260001405	01011 000000000 0001000000011	J8513
7651	EWLL 6.	REVERSAL ANGLE > -10.63 DEG	S	260001406	01011 000000000 0001000000010	J8513
7652	EWLL 7.	REVERSAL ANGLE > -9.23 DEG	S	260001407	01011 000000000 0001000000011	J8513
7653	EWLL 8.	REVERSAL ANGLE > -7.84 DEG	S	260001410	01011 000000000 0001000001000	J8513
7654	EWLL 9.	REVERSAL ANGLE > -6.44 DEG	S	260001411	01011 000000000 0001000001001	J8513
7655	EWLL 10.	REVERSAL ANGLE > -5.05 DEG	S	260001412	01011 000000000 0001000001010	J8513
7656	EWLL 11.	REVERSAL ANGLE > -3.65 DEG	S	260001413	01011 000000000 0001000001011	J8513
7657	EWLL 12.	REVERSAL ANGLE > -2.26 DEG	S	260001414	01011 000000000 0001000001100	J8513
7658	EWLL 13.	REVERSAL ANGLE > -0.86 DEG	S	260001415	01011 000000000 0001000001101	J8513
7659	EWLL 14.	REVERSAL ANGLE > 0.53 DEG	S	260001416	01011 000000000 0001000001110	J8513
7660	EWLL 15.	REVERSAL ANGLE > 1.93 DEG	S	260001417	01011 000000000 0001000001111	J8513
7661	EWLL 16.	REVERSAL ANGLE > 3.33 DEG	S	260001420	01011 000000000 0001000100000	J8513
7662	EWLL 17.	REVERSAL ANGLE > 4.72 DEG	S	260001421	01011 000000000 0001000100001	J8513
7663	EWLL 18.	REVERSAL ANGLE > 6.12 DEG	S	260001422	01011 000000000 0001000100010	J8513
7664	EWLL 19.	REVERSAL ANGLE > 7.51 DEG	S	260001423	01011 000000000 0001000100011	J8513
7665	EWLL 20.	REVERSAL ANGLE > 8.91 DEG	S	260001424	01011 000000000 0001000101000	J8513
7666	EWLL 21.	REVERSAL ANGLE > 10.30 DEG	S	260001425	01011 000000000 0001000101001	J8513
7667	EWLL 22.	REVERSAL ANGLE > 11.70 DEG	S	260001426	01011 000000000 0001000101010	J8513
7668	EWLL 23.	REVERSAL ANGLE > 13.09 DEG	S	260001427	01011 000000000 0001000101011	J8513
7669	EWLL 24.	REVERSAL ANGLE > 14.49 DEG	S	260001430	01011 000000000 0001000110000	J8513
7670	EWLL 25.	REVERSAL ANGLE > 15.88 DEG	S	260001431	01011 000000000 0001000110001	J8513
7671	EWLL 26.	REVERSAL ANGLE > 17.28 DEG	S	260001432	01011 000000000 0001000110010	J8513
7672	EWLL 27.	REVERSAL ANGLE > 18.67 DEG	S	260001433	01011 000000000 0001000110011	J8513
7673	EWLL 28.	REVERSAL ANGLE > 20.07 DEG	S	260001434	01011 000000000 0001000110010	J8513
7674	EWLL 29.	REVERSAL ANGLE > 21.47 DEG	S	260001435	01011 000000000 0001000110011	J8513
7675	EWLL 30.	REVERSAL ANGLE > 22.86 DEG	S	260001436	01011 000000000 0001000110010	J8513
7676	EWLL 31.	REVERSAL ANGLE > 24.26 DEG	S	260001437	01011 000000000 0001000110011	J8513
7677	EWLL 32.	REVERSAL ANGLE > 25.65 DEG	S	260001440	01011 000000000 0001001000000	J8513
7678	EWLL 33.	REVERSAL ANGLE > 27.05 DEG	S	260001441	01011 000000000 0001001000001	J8513

STATE = (PULSE(P), LATCHING(L), UNLATCHING(U), MOMENTARY(M), SERIAL(S), NON-REDUNDANT RELAY(R))

P78-2 COMMAND LIST 08-18-78 REV ?
SC9 EXPERIMENT

TM VERIFICATION AND REFERENCE

STATE OCTAL BINARY BITS 6-32

S CMD NO. NAME REVERSAL ANGLE > 28.44 DEG
7679 EWUL 34. REVERSAL ANGLE > 29.84 DEG
7680 EWUL 35. REVERSAL ANGLE > 31.23 DEG
7681 EWUL 36. REVERSAL ANGLE > 32.63 DEG
7682 EWUL 37. REVERSAL ANGLE > 34.02 DEG
7683 EWUL 38. REVERSAL ANGLE > 35.42 DEG
7684 EWUL 39. REVERSAL ANGLE > 36.81 DEG
7685 EWUL 40. REVERSAL ANGLE > 38.21 DEG
7686 EWUL 41. REVERSAL ANGLE > 39.60 DEG
7687 EWUL 42. REVERSAL ANGLE > 41.00 DEG
7688 EWUL 43. REVERSAL ANGLE > 42.40 DEG
7689 EWUL 44. REVERSAL ANGLE > 43.79 DEG
7690 EWUL 45. REVERSAL ANGLE > 45.19 DEG
7691 EWUL 46. REVERSAL ANGLE > 46.58 DEG
7692 EWUL 47. REVERSAL ANGLE > 47.98 DEG
7693 EWUL 48. REVERSAL ANGLE > 49.37 DEG
7694 EWUL 49. REVERSAL ANGLE > 50.77 DEG
7695 EWUL 50. REVERSAL ANGLE > 52.16 DEG
7696 EWUL 51. REVERSAL ANGLE > 53.56 DEG
7697 EWUL 52. REVERSAL ANGLE > 54.95 DEG
7698 EWUL 53. REVERSAL ANGLE > 56.35 DEG
7699 EWUL 54. REVERSAL ANGLE > 57.74 DEG
7700 EWUL 55. REVERSAL ANGLE > 59.14 DEG
7701 EWUL 56. REVERSAL ANGLE > 60.53 DEG
7702 EWUL 57. REVERSAL ANGLE > 61.93 DEG
7703 EWUL 58. REVERSAL ANGLE > 63.33 DEG
7704 EWUL 59. REVERSAL ANGLE > 64.72 DEG
7705 EWUL 60. REVERSAL ANGLE > 66.12 DEG
7706 EWUL 61. REVERSAL ANGLE > 67.51 DEG
7707 EWUL 62. REVERSAL ANGLE > 68.91 DEG
7708 EWUL 63. REVERSAL ANGLE > 70.30 DEG
7709 EWUL 64. REVERSAL ANGLE > 71.70 DEG
7710 EWUL 65. REVERSAL ANGLE > 73.09 DEG
7711 EWUL 66. REVERSAL ANGLE > 74.49 DEG
7712 EWUL 67. REVERSAL ANGLE > 75.88 DEG
7713 EWUL 68. REVERSAL ANGLE > 77.28 DEG
7714 EWUL 69. REVERSAL ANGLE > 78.67 DEG
7715 EWUL 70. REVERSAL ANGLE > 80.07 DEG
7716 EWUL 71. REVERSAL ANGLE > 81.47 DEG
7717 EWUL 72. REVERSAL ANGLE > 82.86 DEG
7718 EWUL 73. REVERSAL ANGLE > 84.26 DEG
7719 EWUL 74. REVERSAL ANGLE > 85.65 DEG
7720 EWUL 75. REVERSAL ANGLE > 87.05 DEG
7721 EWUL 76. REVERSAL ANGLE > 88.44 DEG
7722 EWUL 77. REVERSAL ANGLE > 89.84 DEG
7723 EWUL 78. REVERSAL ANGLE > 91.23 DEG
7724 EWUL 79. REVERSAL ANGLE > 92.63 DEG
7725 EWUL 80. REVERSAL ANGLE > 94.02 DEG
7726 EWUL 81. REVERSAL ANGLE > 95.42 DEG
7727 EWUL 82. REVERSAL ANGLE > 96.81 DEG
7728 EWUL 83. REVERSAL ANGLE > 98.21 DEG

S 260001442 01011 00000000 0001100100010 J8513
S 260001443 01011 00000000 0001100100011 J8513
S 260001444 01011 00000000 0001100100010 J8513
S 260001445 01011 00000000 0001100100011 J8513
S 260001446 01011 00000000 0001100100010 J8513
S 260001447 01011 00000000 0001100100011 J8513
S 260001450 01011 00000000 0001100100010 J8513
S 260001451 01011 00000000 0001100100011 J8513
S 260001452 01011 00000000 0001100100010 J8513
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S 260001522 01011 00000000 0001100100011 J8513
S 260001523 01011 00000000 0001100100011 J8513

PL5663011

08-18-78 REV ?

P78-2 COMMAND LIST 08-18-78 REV ?
SC9 EXPERIMENT

STATE = (PULSE(P), LATCHING(L), UNLATCHING(U), MOMENTARY(M), SERIAL(S), NON-REDUNDANT RELAY(R))
***** TEST LIST : NO PARITY *****

S CMD NO.	NAME	REVERSAL ANGLE	STATE	OCTAL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
7729	EMUL 84,	REVERSAL ANGLE > 98.21 DEG	S	260001524	01011 00000000 0001101010100	J8513
7730	EMUL 85,	REVERSAL ANGLE > 99.60 DEG	S	260001525	01011 00000000 0001101010101	J8513
7731	EMUL 86,	REVERSAL ANGLE > 101.00 DEG	S	260001526	01011 00000000 0001101010110	J8513
7732	EMUL 87,	REVERSAL ANGLE > 102.40 DEG	S	260001527	01011 00000000 0001101010111	J8513
7733	EMUL 88,	REVERSAL ANGLE > 103.79 DEG	S	260001530	01011 00000000 0001101011000	J8513
7734	EMUL 89,	REVERSAL ANGLE > 105.19 DEG	S	260001531	01011 00000000 0001101011001	J8513
7735	EMUL 90,	REVERSAL ANGLE > 106.58 DEG	S	260001532	01011 00000000 0001101011010	J8513
7736	EMUL 91,	REVERSAL ANGLE > 107.98 DEG	S	260001533	01011 00000000 0001101011011	J8513
7737	EMUL 92,	REVERSAL ANGLE > 109.37 DEG	S	260001534	01011 00000000 0001101011100	J8513
7738	EMUL 93,	REVERSAL ANGLE > 110.77 DEG	S	260001535	01011 00000000 0001101011101	J8513
7739	EMUL 94,	REVERSAL ANGLE > 112.16 DEG	S	260001536	01011 00000000 0001101011110	J8513
7740	EMUL 95,	REVERSAL ANGLE > 113.56 DEG	S	260001537	01011 00000000 0001101011111	J8513
7741	EMUL 96,	REVERSAL ANGLE > 114.95 DEG	S	260001540	01011 00000000 0001101100000	J8513
7742	EMUL 97,	REVERSAL ANGLE > 116.35 DEG	S	260001541	01011 00000000 0001101100001	J8513
7743	EMUL 98,	REVERSAL ANGLE > 117.74 DEG	S	260001542	01011 00000000 0001101100010	J8513
7744	EMUL 99,	REVERSAL ANGLE > 119.14 DEG	S	260001543	01011 00000000 0001101100011	J8513
7745	EMUL 100,	REVERSAL ANGLE > 120.53 DEG	S	260001544	01011 00000000 0001101100100	J8513
7746	EMUL 101,	REVERSAL ANGLE > 121.93 DEG	S	260001545	01011 00000000 0001101100101	J8513
7747	EMUL 102,	REVERSAL ANGLE > 123.33 DEG	S	260001546	01011 00000000 0001101100110	J8513
7748	EMUL 103,	REVERSAL ANGLE > 124.72 DEG	S	260001547	01011 00000000 0001101100111	J8513
7749	EMUL 104,	REVERSAL ANGLE > 126.12 DEG	S	260001550	01011 00000000 0001101101000	J8513
7750	EMUL 105,	REVERSAL ANGLE > 127.51 DEG	S	260001551	01011 00000000 0001101101001	J8513
7751	EMUL 106,	REVERSAL ANGLE > 128.91 DEG	S	260001552	01011 00000000 0001101101010	J8513
7752	EMUL 107,	REVERSAL ANGLE > 130.30 DEG	S	260001553	01011 00000000 0001101101011	J8513
7753	EMUL 108,	REVERSAL ANGLE > 131.70 DEG	S	260001554	01011 00000000 0001101101100	J8513
7754	EMUL 109,	REVERSAL ANGLE > 133.09 DEG	S	260001555	01011 00000000 0001101101101	J8513
7755	EMUL 110,	REVERSAL ANGLE > 134.49 DEG	S	260001556	01011 00000000 0001101101110	J8513
7756	EMUL 111,	REVERSAL ANGLE > 135.88 DEG	S	260001557	01011 00000000 0001101101111	J8513
7757	EMUL 112,	REVERSAL ANGLE > 137.28 DEG	S	260001560	01011 00000000 0001101110000	J8513
7758	EMUL 113,	REVERSAL ANGLE > 138.67 DEG	S	260001581	01011 00000000 0001101110001	J8513
7759	EMUL 114,	REVERSAL ANGLE > 140.07 DEG	S	260001562	01011 00000000 0001101110010	J8513
7760	EMUL 115,	REVERSAL ANGLE > 141.47 DEG	S	260001563	01011 00000000 0001101110011	J8513
7761	EMUL 116,	REVERSAL ANGLE > 142.86 DEG	S	260001564	01011 00000000 0001101110100	J8513
7762	EMUL 117,	REVERSAL ANGLE > 144.26 DEG	S	260001565	01011 00000000 0001101110101	J8513
7763	EMUL 118,	REVERSAL ANGLE > 145.65 DEG	S	260001566	01011 00000000 0001101110110	J8513
7764	EMUL 119,	REVERSAL ANGLE > 147.05 DEG	S	260001567	01011 00000000 0001101110111	J8513
7765	EMUL 120,	REVERSAL ANGLE > 148.44 DEG	S	260001570	01011 00000000 0001101111000	J8513
7766	EMUL 121,	REVERSAL ANGLE > 149.84 DEG	S	260001571	01011 00000000 0001101111001	J8513
7767	EMUL 122,	REVERSAL ANGLE > 151.23 DEG	S	260001572	01011 00000000 0001101111010	J8513
7768	EMUL 123,	REVERSAL ANGLE > 152.63 DEG	S	260001573	01011 00000000 0001101111011	J8513
7769	EMUL 124,	REVERSAL ANGLE > 154.02 DEG	S	260001574	01011 00000000 0001101111100	J8513
7770	EMUL 125,	REVERSAL ANGLE > 155.42 DEG	S	260001575	01011 00000000 0001101111101	J8513
7771	EMUL 126,	REVERSAL ANGLE > 156.81 DEG	S	260001576	01011 00000000 0001101111110	J8513
7772	EMUL 127,	REVERSAL ANGLE > 158.21 DEG	S	260001577	01011 00000000 0001101111111	J8513
7773	EMUL 128,	REVERSAL ANGLE > 159.60 DEG	S	260001600	01011 00000000 0001110000000	J8513
7774	EMUL 129,	REVERSAL ANGLE > 161.00 DEG	S	260001601	01011 00000000 0001110000001	J8513
7775	EMUL 130,	REVERSAL ANGLE > 162.40 DEG	S	260001602	01011 00000000 0001110000010	J8513
7776	EMUL 131,	REVERSAL ANGLE > 163.79 DEG	S	260001603	01011 00000000 0001110000011	J8513
7777	EMUL 132,	REVERSAL ANGLE > 165.19 DEG	S	260001604	01011 00000000 0001110000100	J8513
7778	EMUL 133,	REVERSAL ANGLE > 166.58 DEG	S	260001605	01011 00000000 0001110000101	J8513

S	CMD NO.	NAME	REVERSAL	ANGLE	STATE	QCTAL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
7779	ENUL 134.	REVERSAL	ANGLE	> 187.98 DEG	S	260001606	01011 00000000 000110000110	J8513
7780	ENUL 135.	REVERSAL	ANGLE	> 189.37 DEG	S	260001607	01011 00000000 000110000111	J8513
7781	ENUL 136.	REVERSAL	ANGLE	> 170.77 DEG	S	260001610	01011 00000000 000110000100	J8513
7782	ENUL 137.	REVERSAL	ANGLE	> 172.16 DEG	S	260001611	01011 00000000 000110000100	J8513
7783	ENUL 138.	REVERSAL	ANGLE	> 173.56 DEG	S	260001612	01011 00000000 000110000101	J8513
7784	ENUL 139.	REVERSAL	ANGLE	> 174.95 DEG	S	260001613	01011 00000000 000110000101	J8513
7785	ENUL 140.	REVERSAL	ANGLE	> 176.35 DEG	S	260001614	01011 00000000 000110000101	J8513
7786	ENUL 141.	REVERSAL	ANGLE	> 177.74 DEG	S	260001615	01011 00000000 000110000101	J8513
7787	ENUL 142.	REVERSAL	ANGLE	> 179.14 DEG	S	260001616	01011 00000000 000110000110	J8513
7788	ENUL 143.	REVERSAL	ANGLE	> 180.53 DEG	S	260001617	01011 00000000 000110000111	J8513
7789	ENUL 144.	REVERSAL	ANGLE	> 181.93 DEG	S	260001620	01011 00000000 000110000100	J8513
7790	ENUL 145.	REVERSAL	ANGLE	> 183.33 DEG	S	260001621	01011 00000000 000110000100	J8513
7791	ENUL 146.	REVERSAL	ANGLE	> 184.72 DEG	S	260001622	01011 00000000 000110000100	J8513
7792	ENUL 147.	REVERSAL	ANGLE	> 186.12 DEG	S	260001623	01011 00000000 000110000100	J8513
7793	ENUL 148.	REVERSAL	ANGLE	> 187.51 DEG	S	260001624	01011 00000000 000110000100	J8513
7794	ENUL 149.	REVERSAL	ANGLE	> 188.91 DEG	S	260001625	01011 00000000 000110000101	J8513
7795	ENUL 150.	REVERSAL	ANGLE	> 190.30 DEG	S	260001626	01011 00000000 000110000101	J8513
7796	ENUL 151.	REVERSAL	ANGLE	> 191.70 DEG	S	260001627	01011 00000000 000110000101	J8513
7797	ENUL 152.	REVERSAL	ANGLE	> 193.09 DEG	S	260001630	01011 00000000 000110000100	J8513
7798	ENUL 153.	REVERSAL	ANGLE	> 194.49 DEG	S	260001631	01011 00000000 000110000100	J8513
7799	ENUL 154.	REVERSAL	ANGLE	> 195.88 DEG	S	260001632	01011 00000000 000110000101	J8513
7800	ENUL 155.	REVERSAL	ANGLE	> 197.28 DEG	S	260001633	01011 00000000 000110000101	J8513
7801	ENUL 156.	REVERSAL	ANGLE	> 198.67 DEG	S	260001634	01011 00000000 000110000100	J8513
7802	ENUL 157.	REVERSAL	ANGLE	> 200.07 DEG	S	260001635	01011 00000000 000110000101	J8513
7803	ENUL 158.	REVERSAL	ANGLE	> 201.47 DEG	S	260001636	01011 00000000 000110000110	J8513
7804	ENUL 159.	REVERSAL	ANGLE	> 202.86 DEG	S	260001637	01011 00000000 000110000111	J8513
7805	ENUL 160.	REVERSAL	ANGLE	> 204.26 DEG	S	260001640	01011 00000000 000110000000	J8513
7806	ENUL 161.	REVERSAL	ANGLE	> 205.65 DEG	S	260001641	01011 00000000 000110000000	J8513
7807	ENUL 162.	REVERSAL	ANGLE	> 207.05 DEG	S	260001642	01011 00000000 000110000000	J8513
7808	ENUL 163.	REVERSAL	ANGLE	> 208.44 DEG	S	260001643	01011 00000000 000110000000	J8513
7809	ENUL 164.	REVERSAL	ANGLE	> 209.84 DEG	S	260001644	01011 00000000 000110000000	J8513
7810	ENUL 165.	REVERSAL	ANGLE	> 211.23 DEG	S	260001645	01011 00000000 000110000000	J8513
7811	ENUL 166.	REVERSAL	ANGLE	> 212.63 DEG	S	260001646	01011 00000000 000110000000	J8513
7812	ENUL 167.	REVERSAL	ANGLE	> 214.02 DEG	S	260001647	01011 00000000 000110000000	J8513
7813	ENUL 168.	REVERSAL	ANGLE	> 215.42 DEG	S	260001650	01011 00000000 000110000000	J8513
7814	ENUL 169.	REVERSAL	ANGLE	> 216.81 DEG	S	260001651	01011 00000000 000110000000	J8513
7815	ENUL 170.	REVERSAL	ANGLE	> 218.21 DEG	S	260001652	01011 00000000 000110000000	J8513
7816	ENUL 171.	REVERSAL	ANGLE	> 219.60 DEG	S	260001653	01011 00000000 000110000000	J8513
7817	ENUL 172.	REVERSAL	ANGLE	> 221.00 DEG	S	260001654	01011 00000000 000110000000	J8513
7818	ENUL 173.	REVERSAL	ANGLE	> 222.40 DEG	S	260001655	01011 00000000 000110000000	J8513
7819	ENUL 174.	REVERSAL	ANGLE	> 223.79 DEG	S	260001656	01011 00000000 000110000000	J8513
7820	ENUL 175.	REVERSAL	ANGLE	> 225.19 DEG	S	260001657	01011 00000000 000110000000	J8513
7821	ENUL 176.	REVERSAL	ANGLE	> 226.58 DEG	S	260001658	01011 00000000 000110000000	J8513
7822	ENUL 177.	REVERSAL	ANGLE	> 227.98 DEG	S	260001659	01011 00000000 000110000000	J8513
7823	ENUL 178.	REVERSAL	ANGLE	> 229.37 DEG	S	260001662	01011 00000000 000110000000	J8513
7824	ENUL 179.	REVERSAL	ANGLE	> 230.77 DEG	S	260001663	01011 00000000 000110000000	J8513
7825	ENUL 180.	REVERSAL	ANGLE	> 232.16 DEG	S	260001664	01011 00000000 000110000000	J8513
7826	ENUL 0.	FORCED REVERSAL ANGLE			S	260001400	01011 00000000 000110000000	J8513
7827	ENUL 255.	FORCED REVERSAL ANGLE			S	260001777	01011 00000000 000110000000	J8513
7828	ENUL 255.	FORCED REVERSAL ANGLE			S	260003000	01011 00000000 000110000000	J8513

P78-2 COMMAND LIST 08-18-78 REV ?
SC9 EXPERIMENT

STATE = (PULSE(P), LATCHING(L), UNLATCHING(U), MOMENTARY(M), SERIAL(S), NON-REDUNDANT RELAY(R))
***** TEST LIST : NO PARITY *****

S CMD NO.	NAME	STATE	OCIAL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
7829	NORTH/SOUTH PARK AT 90 DEGREES	S	260002240	01011 000000000 0010010100000	J8569
7830	NS SWEEP BETWEEN OPTICAL LIMITS	S	260002244	01011 000000000 0010010100100	J8569
7831	NORTH/SOUTH PARK AT -20 DEGREES	S	260002245	01011 000000000 0010010100101	J8569
7832	NORTH/SOUTH PARK AT 0 DEGREES	S	260002246	01011 000000000 0010010100110	J8569
7833	NORTH/SOUTH PARK AT 180 DEGREES	S	260002254	01011 000000000 0010010101100	J8569
7834	NORTH/SOUTH PARK AT 200 DEGREES	S	260002264	01011 000000000 0010010110100	J8569
7835	NS MAG BETWEEN UPPER AND LOWER LIMITS	S	260002344	01011 000000000 0010011001000	J8569
7836	EAST/WEST PARK IMMEDIATE	S	260002400	01011 000000000 0010100000000	J8570
7837	EAST/WEST PARK AT 90 DEGREES	S	260002540	01011 000000000 0010101000000	J8570
7838	EW SWEEP BETWEEN OPTICAL LIMITS	S	260002644	01011 000000000 0010101001000	J8570
7839	EAST/WEST PARK AT -20 DEGREES	S	260002645	01011 000000000 0010101001010	J8570
7840	EAST/WEST PARK AT 0 DEGREES	S	260002646	01011 000000000 0010101001011	J8570
7841	EAST/WEST PARK AT 180 DEGREES	S	260002654	01011 000000000 0010101001100	J8570
7842	EAST/WEST PARK AT 200 DEGREES	S	260002664	01011 000000000 0010101001100	J8570
7843	EW MAG BETWEEN UPPER AND LOWER LIMITS	S	260002744	01011 000000000 0010111001000	J8570
7844	SCAN ONLY	S	260003000	01011 000000000 0010000000000	J8532
7845	DWELL TIME 128=64 SECONDS 128	S	260003200	01011 000000000 0010100000000	J8532
7846	DWELL TIME 128=64 SECONDS 128	S	260003201	01011 000000000 0010100000001	J8532
7847	DWELL TIME 130=62 SECONDS 128	S	260003202	01011 000000000 0010100000010	J8532
7848	DWELL TIME 131=61 SECONDS 128	S	260003203	01011 000000000 0010100000011	J8532
7849	DWELL TIME 132=60 SECONDS 128	S	260003204	01011 000000000 0010100000010	J8532
7850	DWELL TIME 133=59 SECONDS 128	S	260003205	01011 000000000 0010100000011	J8532
7851	DWELL TIME 134=58 SECONDS 128	S	260003206	01011 000000000 0010100000010	J8532
7852	DWELL TIME 135=57 SECONDS 128	S	260003207	01011 000000000 0010100000011	J8532
7853	DWELL TIME 136=56 SECONDS 128	S	260003210	01011 000000000 0010100000010	J8532
7854	DWELL TIME 137=55 SECONDS 128	S	260003211	01011 000000000 0010100000011	J8532
7855	DWELL TIME 138=54 SECONDS 128	S	260003212	01011 000000000 0010100000010	J8532
7856	DWELL TIME 139=53 SECONDS 128	S	260003213	01011 000000000 0010100000011	J8532
7857	DWELL TIME 140=52 SECONDS 128	S	260003214	01011 000000000 0010100000010	J8532
7858	DWELL TIME 141=51 SECONDS 128	S	260003215	01011 000000000 0010100000011	J8532
7859	DWELL TIME 142=50 SECONDS 128	S	260003216	01011 000000000 0010100000010	J8532
7860	DWELL TIME 143=49 SECONDS 128	S	260003217	01011 000000000 0010100000011	J8532
7861	DWELL TIME 144=48 SECONDS 128	S	260003220	01011 000000000 0010100000010	J8532
7862	DWELL TIME 145=47 SECONDS 128	S	260003221	01011 000000000 0010100000011	J8532
7863	DWELL TIME 146=46 SECONDS 128	S	260003222	01011 000000000 0010100000010	J8532
7864	DWELL TIME 147=45 SECONDS 128	S	260003223	01011 000000000 0010100000011	J8532
7865	DWELL TIME 148=44 SECONDS 128	S	260003224	01011 000000000 0010100000010	J8532
7866	DWELL TIME 149=43 SECONDS 128	S	260003225	01011 000000000 0010100000011	J8532
7867	DWELL TIME 150=42 SECONDS 128	S	260003226	01011 000000000 0010100000010	J8532
7868	DWELL TIME 151=41 SECONDS 128	S	260003227	01011 000000000 0010100000011	J8532
7869	DWELL TIME 152=40 SECONDS 128	S	260003230	01011 000000000 0010100000010	J8532
7870	DWELL TIME 153=39 SECONDS 128	S	260003231	01011 000000000 0010100000011	J8532
7871	DWELL TIME 154=38 SECONDS 128	S	260003232	01011 000000000 0010100000010	J8532
7872	DWELL TIME 155=37 SECONDS 128	S	260003233	01011 000000000 0010100000011	J8532
7873	DWELL TIME 156=36 SECONDS 128	S	260003234	01011 000000000 0010100000010	J8532
7874	DWELL TIME 157=35 SECONDS 128	S	260003235	01011 000000000 0010100000011	J8532
7875	DWELL TIME 158=34 SECONDS 128	S	260003236	01011 000000000 0010100000010	J8532
7876	DWELL TIME 159=33 SECONDS 128	S	260003237	01011 000000000 0010100000011	J8532
7877	DWELL TIME 160=32 SECONDS 128	S	260003240	01011 000000000 0010100000010	J8532
7878	DWELL TIME 161=31 SECONDS 128	S	260003241	01011 000000000 0010100000011	J8532

STATE = (PULSE(P), LATCHING(L), UNLATCHING(U), MOMENTARY(M), SERIAL(S), NON-REDUNDANT RELAY(R))
***** TEST LIST : NO PARITY *****

S CMD NO.	NAME	TIME	SECONDS	STATE	DOTAL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
7879	DWELL	162-30	SECONDS 54	S	260003242	01011 00000000 0011010100010	J8532
7880	DWELL	163-30	SECONDS 54	S	260003243	01011 00000000 0011010100011	J8532
7881	DWELL	164-30	SECONDS 54	S	260003244	01011 00000000 0011010100010	J8532
7882	DWELL	165-30	SECONDS 54	S	260003245	01011 00000000 0011010100011	J8532
7883	DWELL	166-30	SECONDS 54	S	260003246	01011 00000000 0011010100010	J8532
7884	DWELL	167-30	SECONDS 54	S	260003247	01011 00000000 0011010100011	J8532
7885	DWELL	168-30	SECONDS 54	S	260003250	01011 00000000 0011010100010	J8532
7886	DWELL	169-30	SECONDS 54	S	260003251	01011 00000000 0011010100011	J8532
7887	DWELL	170-30	SECONDS 54	S	260003252	01011 00000000 0011010100010	J8532
7888	DWELL	171-30	SECONDS 54	S	260003253	01011 00000000 0011010100011	J8532
7889	DWELL	172-30	SECONDS 54	S	260003254	01011 00000000 0011010100010	J8532
7890	DWELL	173-30	SECONDS 54	S	260003255	01011 00000000 0011010100011	J8532
7891	DWELL	174-30	SECONDS 54	S	260003256	01011 00000000 0011010100010	J8532
7892	DWELL	175-30	SECONDS 54	S	260003257	01011 00000000 0011010100011	J8532
7893	DWELL	176-30	SECONDS 54	S	260003260	01011 00000000 0011010100010	J8532
7894	DWELL	177-30	SECONDS 54	S	260003261	01011 00000000 0011010100011	J8532
7895	DWELL	178-30	SECONDS 54	S	260003262	01011 00000000 0011010100010	J8532
7896	DWELL	179-30	SECONDS 54	S	260003263	01011 00000000 0011010100011	J8532
7897	DWELL	180-30	SECONDS 54	S	260003264	01011 00000000 0011010100010	J8532
7898	DWELL	181-30	SECONDS 54	S	260003265	01011 00000000 0011010100011	J8532
7899	DWELL	182-30	SECONDS 54	S	260003266	01011 00000000 0011010100010	J8532
7900	DWELL	183-30	SECONDS 54	S	260003267	01011 00000000 0011010100011	J8532
7901	DWELL	184-30	SECONDS 54	S	260003270	01011 00000000 0011010100010	J8532
7902	DWELL	185-30	SECONDS 54	S	260003271	01011 00000000 0011010100011	J8532
7903	DWELL	186-30	SECONDS 54	S	260003272	01011 00000000 0011010100010	J8532
7904	DWELL	187-30	SECONDS 54	S	260003273	01011 00000000 0011010100011	J8532
7905	DWELL	188-30	SECONDS 54	S	260003274	01011 00000000 0011010100010	J8532
7906	DWELL	189-30	SECONDS 54	S	260003275	01011 00000000 0011010100011	J8532
7907	DWELL	190-30	SECONDS 54	S	260003276	01011 00000000 0011010100010	J8532
7908	DWELL	191-30	SECONDS 54	S	260003277	01011 00000000 0011010100011	J8532
7909	DWELL	192-30	SECONDS 54	S	260003300	01011 00000000 0011010000000	J8532
7910	DWELL	193-30	SECONDS 54	S	260003301	01011 00000000 0011010000001	J8532
7911	DWELL	194-30	SECONDS 54	S	260003302	01011 00000000 0011010000010	J8532
7912	DWELL	195-30	SECONDS 54	S	260003303	01011 00000000 0011010000011	J8532
7913	DWELL	196-30	SECONDS 54	S	260003304	01011 00000000 0011010000100	J8532
7914	DWELL	197-30	SECONDS 54	S	260003305	01011 00000000 0011010000101	J8532
7915	DWELL	198-30	SECONDS 54	S	260003306	01011 00000000 0011010000110	J8532
7916	DWELL	199-30	SECONDS 54	S	260003307	01011 00000000 0011010000111	J8532
7917	DWELL	200-30	SECONDS 54	S	260003310	01011 00000000 0011010010000	J8532
7918	DWELL	201-30	SECONDS 54	S	260003311	01011 00000000 0011010010001	J8532
7919	DWELL	202-30	SECONDS 54	S	260003312	01011 00000000 0011010010010	J8532
7920	DWELL	203-30	SECONDS 54	S	260003313	01011 00000000 0011010010011	J8532
7921	DWELL	204-30	SECONDS 54	S	260003314	01011 00000000 0011010010100	J8532
7922	DWELL	205-30	SECONDS 54	S	260003315	01011 00000000 0011010010101	J8532
7923	DWELL	206-30	SECONDS 54	S	260003316	01011 00000000 0011010010110	J8532
7924	DWELL	207-30	SECONDS 54	S	260003317	01011 00000000 0011010010111	J8532
7925	DWELL	208-30	SECONDS 54	S	260003320	01011 00000000 0011010100000	J8532
7926	DWELL	209-30	SECONDS 54	S	260003321	01011 00000000 0011010100001	J8532
7927	DWELL	210-30	SECONDS 54	S	260003322	01011 00000000 0011010100010	J8532
7928	DWELL	211-30	SECONDS 54	S	260003323	01011 00000000 0011010100011	J8532

P78-2 COMMAND LIST 08-18-78 REV ?
SC9 EXPERIMENT

STATE * (PULSE(P), LATCHING(L), UNLATCHING(U), MOMENTARY(M), SERIAL(S), NON-REDUNDANT RELAY(R))
***** TEST LIST : NO PARITY *****

S CMD NO.	NAME	STATE	OCTAL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
7929	DWELL TIME 212=44 SECONDS	S	260003324	01011 00000000 0011011010100	J8532
7930	DWELL TIME 213=43 SECONDS	S	260003325	01011 00000000 0011011010101	J8532
7931	DWELL TIME 214=42 SECONDS	S	260003326	01011 00000000 0011011010110	J8532
7932	DWELL TIME 215=41 SECONDS	S	260003327	01011 00000000 0011011010111	J8532
7933	DWELL TIME 216=40 SECONDS	S	260003330	01011 00000000 0011011011000	J8532
7934	DWELL TIME 217=39 SECONDS	S	260003331	01011 00000000 0011011011001	J8532
7935	DWELL TIME 218=38 SECONDS	S	260003332	01011 00000000 0011011011010	J8532
7936	DWELL TIME 219=37 SECONDS	S	260003333	01011 00000000 0011011011011	J8532
7937	DWELL TIME 220=36 SECONDS	S	260003334	01011 00000000 0011011011100	J8532
7938	DWELL TIME 221=35 SECONDS	S	260003335	01011 00000000 0011011011101	J8532
7939	DWELL TIME 222=34 SECONDS	S	260003336	01011 00000000 0011011011110	J8532
7940	DWELL TIME 223=33 SECONDS	S	260003337	01011 00000000 0011011011111	J8532
7941	DWELL TIME 224=32 SECONDS	S	260003340	01011 00000000 0011011000000	J8532
7942	DWELL TIME 225=31 SECONDS	S	260003341	01011 00000000 0011011000001	J8532
7943	DWELL TIME 226=30 SECONDS	S	260003342	01011 00000000 0011011000010	J8532
7944	DWELL TIME 227=29 SECONDS	S	260003343	01011 00000000 0011011000011	J8532
7945	DWELL TIME 228=28 SECONDS	S	260003344	01011 00000000 0011011000100	J8532
7946	DWELL TIME 229=27 SECONDS	S	260003345	01011 00000000 0011011000101	J8532
7947	DWELL TIME 230=26 SECONDS	S	260003346	01011 00000000 0011011000110	J8532
7948	DWELL TIME 231=25 SECONDS	S	260003347	01011 00000000 0011011000111	J8532
7949	DWELL TIME 232=24 SECONDS	S	260003350	01011 00000000 0011011010000	J8532
7950	DWELL TIME 233=23 SECONDS	S	260003351	01011 00000000 0011011010001	J8532
7951	DWELL TIME 234=22 SECONDS	S	260003352	01011 00000000 0011011010010	J8532
7952	DWELL TIME 235=21 SECONDS	S	260003353	01011 00000000 0011011010011	J8532
7953	DWELL TIME 236=20 SECONDS	S	260003354	01011 00000000 0011011010100	J8532
7954	DWELL TIME 237=19 SECONDS	S	260003355	01011 00000000 0011011010101	J8532
7955	DWELL TIME 238=18 SECONDS	S	260003356	01011 00000000 0011011010110	J8532
7956	DWELL TIME 239=17 SECONDS	S	260003357	01011 00000000 0011011010111	J8532
7957	DWELL TIME 240=16 SECONDS	S	260003360	01011 00000000 0011011100000	J8532
7958	DWELL TIME 241=15 SECONDS	S	260003361	01011 00000000 0011011100001	J8532
7959	DWELL TIME 242=14 SECONDS	S	260003362	01011 00000000 0011011100010	J8532
7960	DWELL TIME 243=13 SECONDS	S	260003363	01011 00000000 0011011100011	J8532
7961	DWELL TIME 244=12 SECONDS	S	260003364	01011 00000000 0011011101000	J8532
7962	DWELL TIME 245=11 SECONDS	S	260003365	01011 00000000 0011011101001	J8532
7963	DWELL TIME 246=10 SECONDS	S	260003366	01011 00000000 0011011101010	J8532
7964	DWELL TIME 247=9 SECONDS	S	260003367	01011 00000000 0011011101011	J8532
7965	DWELL TIME 248=8 SECONDS	S	260003370	01011 00000000 0011011110000	J8532
7966	DWELL TIME 249=7 SECONDS	S	260003371	01011 00000000 0011011110001	J8532
7967	DWELL TIME 250=6 SECONDS	S	260003372	01011 00000000 0011011110010	J8532
7968	DWELL TIME 251=5 SECONDS	S	260003373	01011 00000000 0011011110011	J8532
7969	DWELL TIME 252=4 SECONDS	S	260003374	01011 00000000 0011011111000	J8532
7970	DWELL TIME 253=3 SECONDS	S	260003375	01011 00000000 0011011111001	J8532
7971	DWELL TIME 254=2 SECONDS	S	260003376	01011 00000000 0011011111010	J8532
7972	DWELL TIME 255=1 SECOND	S	260003377	01011 00000000 0011011111011	J8532
7973	START DWELL NO. AT 64 DWELLS/CYCLE	S	260003400	01011 00000000 0011000000000	J8533
7974	START DWELL NO. AT 62 DWELLS/CYCLE	S	260003401	01011 00000000 0011000000001	J8533
7975	START DWELL NO. AT 60 DWELLS/CYCLE	S	260003402	01011 00000000 0011000000010	J8533
7976	START DWELL NO. AT 58 DWELLS/CYCLE	S	260003403	01011 00000000 0011000000011	J8533
7977	START DWELL NO. AT 56 DWELLS/CYCLE	S	260003404	01011 00000000 0011000000100	J8533
7978	START DWELL NO. AT 54 DWELLS/CYCLE	S	260003405	01011 00000000 0011000000101	J8533

P78-2 COMMAND LIST 08-18-78 REV ?
SC9 EXPERIMENT

STATE = (PULSE(P), LATCHING(L), UNLATCHING(U), MOMENTARY(M), SERIAL(S), NON-REDUNDANT RELAY(R))
***** TEST LIST : NO PARITY *****

S CMD NO.	NAME	START DWELL NO.	AT	DWELLS/CYCLE
7579	START DWELL	NO.	AT 52	DWELLS/CYCLE
7580	START DWELL	NO.	AT 50	DWELLS/CYCLE
7581	START DWELL	NO.	AT 48	DWELLS/CYCLE
7582	START DWELL	NO.	AT 46	DWELLS/CYCLE
7583	START DWELL	NO.	AT 44	DWELLS/CYCLE
7584	START DWELL	NO.	AT 42	DWELLS/CYCLE
7585	START DWELL	NO.	AT 40	DWELLS/CYCLE
7586	START DWELL	NO.	AT 38	DWELLS/CYCLE
7587	START DWELL	NO.	AT 36	DWELLS/CYCLE
7588	START DWELL	NO.	AT 34	DWELLS/CYCLE
7589	START DWELL	NO.	AT 32	DWELLS/CYCLE
7590	START DWELL	NO.	AT 30	DWELLS/CYCLE
7591	START DWELL	NO.	AT 28	DWELLS/CYCLE
7592	START DWELL	NO.	AT 26	DWELLS/CYCLE
7593	START DWELL	NO.	AT 24	DWELLS/CYCLE
7594	START DWELL	NO.	AT 22	DWELLS/CYCLE
7595	START DWELL	NO.	AT 20	DWELLS/CYCLE
7596	START DWELL	NO.	AT 18	DWELLS/CYCLE
7597	START DWELL	NO.	AT 16	DWELLS/CYCLE
7598	START DWELL	NO.	AT 14	DWELLS/CYCLE
7599	START DWELL	NO.	AT 12	DWELLS/CYCLE
8000	START DWELL	NO.	AT 10	DWELLS/CYCLE
8001	START DWELL	NO.	AT 8	DWELLS/CYCLE
8002	START DWELL	NO.	AT 6	DWELLS/CYCLE
8003	START DWELL	NO.	AT 4	DWELLS/CYCLE
8004	START DWELL	NO.	AT 2	DWELLS/CYCLE
8005	PRESET DWELL	NO.	AT 64	DWELLS/CYCLE
8006	PRESET DWELL	NO.	AT 62	DWELLS/CYCLE
8007	PRESET DWELL	NO.	AT 60	DWELLS/CYCLE
8008	PRESET DWELL	NO.	AT 58	DWELLS/CYCLE
8009	PRESET DWELL	NO.	AT 56	DWELLS/CYCLE
8010	PRESET DWELL	NO.	AT 54	DWELLS/CYCLE
8011	PRESET DWELL	NO.	AT 52	DWELLS/CYCLE
8012	PRESET DWELL	NO.	AT 50	DWELLS/CYCLE
8013	PRESET DWELL	NO.	AT 48	DWELLS/CYCLE
8014	PRESET DWELL	NO.	AT 46	DWELLS/CYCLE
8015	PRESET DWELL	NO.	AT 44	DWELLS/CYCLE
8016	PRESET DWELL	NO.	AT 42	DWELLS/CYCLE
8017	PRESET DWELL	NO.	AT 40	DWELLS/CYCLE
8018	PRESET DWELL	NO.	AT 38	DWELLS/CYCLE
8019	PRESET DWELL	NO.	AT 36	DWELLS/CYCLE
8020	PRESET DWELL	NO.	AT 34	DWELLS/CYCLE
8021	PRESET DWELL	NO.	AT 32	DWELLS/CYCLE
8022	PRESET DWELL	NO.	AT 30	DWELLS/CYCLE
8023	PRESET DWELL	NO.	AT 28	DWELLS/CYCLE
8024	PRESET DWELL	NO.	AT 26	DWELLS/CYCLE
8025	PRESET DWELL	NO.	AT 24	DWELLS/CYCLE
8026	PRESET DWELL	NO.	AT 22	DWELLS/CYCLE
8027	PRESET DWELL	NO.	AT 20	DWELLS/CYCLE
8028	PRESET DWELL	NO.	AT 18	DWELLS/CYCLE

STATE	CTCL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
S	260003406	01011 00000000 001100000110	J8533
S	260003407	01011 00000000 001100000111	J8533
S	260003410	01011 00000000 001100001000	J8533
S	260003411	01011 00000000 001100001001	J8533
S	260003412	01011 00000000 001100001010	J8533
S	260003413	01011 00000000 001100001011	J8533
S	260003414	01011 00000000 001100001100	J8533
S	260003415	01011 00000000 001100001101	J8533
S	260003416	01011 00000000 001100001110	J8533
S	260003417	01011 00000000 001100001111	J8533
S	260003420	01011 00000000 001100010000	J8533
S	260003421	01011 00000000 001100010001	J8533
S	260003422	01011 00000000 001100010010	J8533
S	260003423	01011 00000000 001100010011	J8533
S	260003424	01011 00000000 001100010100	J8533
S	260003425	01011 00000000 001100010101	J8533
S	260003426	01011 00000000 001100010110	J8533
S	260003427	01011 00000000 001100010111	J8533
S	260003430	01011 00000000 001100010100	J8533
S	260003431	01011 00000000 001100010101	J8533
S	260003432	01011 00000000 001100010110	J8533
S	260003433	01011 00000000 001100010111	J8533
S	260003434	01011 00000000 001100011000	J8533
S	260003435	01011 00000000 001100011001	J8533
S	260003436	01011 00000000 001100011010	J8533
S	260003437	01011 00000000 001100011011	J8533
S	260003440	01011 00000000 001100100000	J8533
S	260003441	01011 00000000 001100100001	J8533
S	260003442	01011 00000000 001100100010	J8533
S	260003443	01011 00000000 001100100011	J8533
S	260003444	01011 00000000 001100100100	J8533
S	260003445	01011 00000000 001100100101	J8533
S	260003446	01011 00000000 001100100110	J8533
S	260003447	01011 00000000 001100100111	J8533
S	260003450	01011 00000000 001100101000	J8533
S	260003451	01011 00000000 001100101001	J8533
S	260003452	01011 00000000 001100101010	J8533
S	260003453	01011 00000000 001100101011	J8533
S	260003454	01011 00000000 001100101100	J8533
S	260003455	01011 00000000 001100101101	J8533
S	260003456	01011 00000000 001100101110	J8533
S	260003457	01011 00000000 001100101111	J8533
S	260003460	01011 00000000 001100110000	J8533
S	260003461	01011 00000000 001100110001	J8533
S	260003462	01011 00000000 001100110010	J8533
S	260003463	01011 00000000 001100110011	J8533
S	260003464	01011 00000000 001100110100	J8533
S	260003465	01011 00000000 001100110101	J8533
S	260003466	01011 00000000 001100110110	J8533
S	260003467	01011 00000000 001100110111	J8533

S CMD NO.	NAME	STATE	DCIAL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
8029	PRESET DWELL NO. AT 16 DWELLS/CYCLE	S	260003470	01011 00000000 0011100111000	J8533
8030	PRESET DWELL NO. AT 14 DWELLS/CYCLE	S	260003471	01011 00000000 0011100111001	J8533
8031	PRESET DWELL NO. AT 12 DWELLS/CYCLE	S	260003472	01011 00000000 0011100111010	J8533
8032	PRESET DWELL NO. AT 10 DWELLS/CYCLE	S	260003473	01011 00000000 0011100111011	J8533
8033	PRESET DWELL NO. AT 8 DWELLS/CYCLE	S	260003474	01011 00000000 0011100111100	J8533
8034	PRESET DWELL NO. AT 6 DWELLS/CYCLE	S	260003475	01011 00000000 0011100111101	J8533
8035	PRESET DWELL NO. AT 4 DWELLS/CYCLE	S	260003476	01011 00000000 0011100111110	J8533
8036	PRESET DWELL NO. AT 2 DWELLS/CYCLE	S	260003477	01011 00000000 0011100111111	J8533
8037	INITIAL DWELL STEP=0	S	260004000	01011 00000000 0100000000000	J8534
8038	INITIAL DWELL STEP=1	S	260004001	01011 00000000 0100000000001	J8534
8039	INITIAL DWELL STEP=2	S	260004002	01011 00000000 0100000000010	J8534
8040	INITIAL DWELL STEP=3	S	260004003	01011 00000000 0100000000011	J8534
8041	INITIAL DWELL STEP=4	S	260004004	01011 00000000 0100000000100	J8534
8042	INITIAL DWELL STEP=5	S	260004005	01011 00000000 0100000000101	J8534
8043	INITIAL DWELL STEP=6	S	260004006	01011 00000000 0100000000110	J8534
8044	INITIAL DWELL STEP=7	S	260004007	01011 00000000 0100000000111	J8534
8045	INITIAL DWELL STEP=8	S	260004010	01011 00000000 0100000001000	J8534
8046	INITIAL DWELL STEP=9	S	260004011	01011 00000000 0100000001001	J8534
8047	INITIAL DWELL STEP=10	S	260004012	01011 00000000 0100000001010	J8534
8048	INITIAL DWELL STEP=11	S	260004013	01011 00000000 0100000001011	J8534
8049	INITIAL DWELL STEP=12	S	260004014	01011 00000000 0100000001100	J8534
8050	INITIAL DWELL STEP=13	S	260004015	01011 00000000 0100000001101	J8534
8051	INITIAL DWELL STEP=14	S	260004016	01011 00000000 0100000001110	J8534
8052	INITIAL DWELL STEP=15	S	260004017	01011 00000000 0100000001111	J8534
8053	INITIAL DWELL STEP=16	S	260004020	01011 00000000 0100000010000	J8534
8054	INITIAL DWELL STEP=17	S	260004021	01011 00000000 0100000010001	J8534
8055	INITIAL DWELL STEP=18	S	260004022	01011 00000000 0100000010010	J8534
8056	INITIAL DWELL STEP=19	S	260004023	01011 00000000 0100000010011	J8534
8057	INITIAL DWELL STEP=20	S	260004024	01011 00000000 0100000010100	J8534
8058	INITIAL DWELL STEP=21	S	260004025	01011 00000000 0100000010101	J8534
8059	INITIAL DWELL STEP=22	S	260004026	01011 00000000 0100000010110	J8534
8060	INITIAL DWELL STEP=23	S	260004027	01011 00000000 0100000010111	J8534
8061	INITIAL DWELL STEP=24	S	260004030	01011 00000000 0100000011000	J8534
8062	INITIAL DWELL STEP=25	S	260004031	01011 00000000 0100000011001	J8534
8063	INITIAL DWELL STEP=26	S	260004032	01011 00000000 0100000011010	J8534
8064	INITIAL DWELL STEP=27	S	260004033	01011 00000000 0100000011011	J8534
8065	INITIAL DWELL STEP=28	S	260004034	01011 00000000 0100000011100	J8534
8066	INITIAL DWELL STEP=29	S	260004035	01011 00000000 0100000011101	J8534
8067	INITIAL DWELL STEP=30	S	260004036	01011 00000000 0100000011110	J8534
8068	INITIAL DWELL STEP=31	S	260004037	01011 00000000 0100000011111	J8534
8069	INITIAL DWELL STEP=32	S	260004040	01011 00000000 0100000100000	J8534
8070	INITIAL DWELL STEP=33	S	260004041	01011 00000000 0100000100001	J8534
8071	INITIAL DWELL STEP=34	S	260004042	01011 00000000 0100000100010	J8534
8072	INITIAL DWELL STEP=35	S	260004043	01011 00000000 0100000100011	J8534
8073	INITIAL DWELL STEP=36	S	260004044	01011 00000000 0100000100100	J8534
8074	INITIAL DWELL STEP=37	S	260004045	01011 00000000 0100000100101	J8534
8075	INITIAL DWELL STEP=38	S	260004046	01011 00000000 0100000100110	J8534
8076	INITIAL DWELL STEP=39	S	260004047	01011 00000000 0100000100111	J8534
8077	INITIAL DWELL STEP=40	S	260004050	01011 00000000 0100000101000	J8534
8078	INITIAL DWELL STEP=41	S	260004051	01011 00000000 0100000101001	J8534

S CMD NO. NAME STATE OCTAL BINARY BITS 6-32 TM VERIFICATION AND REFERENCE

8379	INITIAL DWELL STEP=42	S	260004052	01011	00000000	0100000101010	J8534
8380	INITIAL DWELL STEP=43	S	260004053	01011	00000000	0100000101011	J8534
8381	INITIAL DWELL STEP=44	S	260004054	01011	00000000	0100000101100	J8534
8382	INITIAL DWELL STEP=45	S	260004055	01011	00000000	0100000101101	J8534
8383	INITIAL DWELL STEP=46	S	260004056	01011	00000000	0100000101110	J8534
8384	INITIAL DWELL STEP=47	S	260004057	01011	00000000	0100000101111	J8534
8385	INITIAL DWELL STEP=48	S	260004060	01011	00000000	0100000110000	J8534
8386	INITIAL DWELL STEP=49	S	260004061	01011	00000000	0100000110001	J8534
8387	INITIAL DWELL STEP=50	S	260004062	01011	00000000	0100000110010	J8534
8388	INITIAL DWELL STEP=51	S	260004063	01011	00000000	0100000110011	J8534
8389	INITIAL DWELL STEP=52	S	260004064	01011	00000000	0100000110100	J8534
8390	INITIAL DWELL STEP=53	S	260004065	01011	00000000	0100000110101	J8534
8391	INITIAL DWELL STEP=54	S	260004066	01011	00000000	0100000110110	J8534
8392	INITIAL DWELL STEP=55	S	260004067	01011	00000000	0100000110111	J8534
8393	INITIAL DWELL STEP=56	S	260004070	01011	00000000	0100000111000	J8534
8394	INITIAL DWELL STEP=57	S	260004071	01011	00000000	0100000111001	J8534
8395	INITIAL DWELL STEP=58	S	260004072	01011	00000000	0100000111010	J8534
8396	INITIAL DWELL STEP=59	S	260004073	01011	00000000	0100000111011	J8534
8397	INITIAL DWELL STEP=60	S	260004074	01011	00000000	0100000111100	J8534
8398	INITIAL DWELL STEP=61	S	260004075	01011	00000000	0100000111101	J8534
8399	INITIAL DWELL STEP=62	S	260004076	01011	00000000	0100000111110	J8534
8400	INITIAL DWELL STEP=63	S	260004077	01011	00000000	0100000111111	J8534
8401	DWELL STEP SIZE=1	S	260004401	01011	00000000	0100100000001	J8535
8402	DWELL STEP SIZE=2	S	260004402	01011	00000000	0100100000010	J8535
8403	DWELL STEP SIZE=4	S	260004404	01011	00000000	0100100000100	J8535
8404	DWELL STEP SIZE=8	S	260004410	01011	00000000	01001000001000	J8535
8405	DWELL STEP SIZE=16	S	260004420	01011	00000000	0100100010000	J8535
8406	DWELL STEP SIZE=32	S	260004440	01011	00000000	0100100100000	J8535
8407	3KHZ GATE=PNS:LO EN.=NO: NORMAL MODE	S	260005000	01011	00000000	0101000000000	J8538
8408	3KHZ GATE=PNS:LO EN.=NO: FAST ION MODE	S	260005001	01011	00000000	0101000000001	J8538
8409	3KHZ GATE=PNS:LO EN.=NO: FAST MIX MODE	S	260005002	01011	00000000	0101000000010	J8538
8410	3KHZ GATE=PNS:LO EN.=NO: SF: PMS MODE	S	260005003	01011	00000000	0101000000011	J8538
8411	3KHZ GATE=PNS:LO EN.=NO: SF: PMS MODE	S	260005004	01011	00000000	0101000000100	J8538
8412	3KHZ GATE=PNS:LO EN.=NO: SF: PMS MODE	S	260005005	01011	00000000	0101000000101	J8538
8413	3KHZ GATE=PNS:LO EN.=NO: SF: PMS MODE	S	260005006	01011	00000000	0101000000110	J8538
8414	3KHZ GATE=PNS:LO EN.=NO: SF: PMS MODE	S	260005007	01011	00000000	0101000000111	J8538
8415	3KHZ GATE=PNS:LO EN.=YES: NORMAL MODE	S	260005010	01011	00000000	0101000001000	J8538
8416	3KHZ GATE=PNS:LO EN.=YES: FAST ION MODE	S	260005011	01011	00000000	0101000001001	J8538
8417	3KHZ GATE=PNS:LO EN.=YES: FAST MIX MODE	S	260005012	01011	00000000	0101000001010	J8538
8418	3KHZ GATE=PNS:LO EN.=YES: SF: PMS MODE	S	260005013	01011	00000000	0101000001011	J8538
8419	3KHZ GATE=PNS:LO EN.=YES: SF: PMS MODE	S	260005014	01011	00000000	0101000001100	J8538
8420	3KHZ GATE=PNS:LO EN.=YES: SF: PMS MODE	S	260005015	01011	00000000	0101000001101	J8538
8421	3KHZ GATE=PNS:LO EN.=YES: SF: PMS MODE	S	260005016	01011	00000000	0101000001110	J8538
8422	3KHZ GATE=PNS:LO EN.=YES: SF: PMS MODE	S	260005017	01011	00000000	0101000001111	J8538
8423	3KHZ GATE=PNS:LO EN.=NO: NORMAL MODE	S	260005020	01011	00000000	0101000010000	J8338
8424	3KHZ GATE=PNS:LO EN.=NO: FAST ION MODE	S	260005021	01011	00000000	0101000010001	J8338
8425	3KHZ GATE=PNS:LO EN.=NO: FAST MIX MODE	S	260005022	01011	00000000	0101000010010	J8338
8426	3KHZ GATE=PNS:LO EN.=NO: SF: PMS MODE	S	260005023	01011	00000000	0101000010011	J8338
8427	3KHZ GATE=PNS:LO EN.=NO: SF: PMS MODE	S	260005024	01011	00000000	0101000010100	J8338
8428	3KHZ GATE=PNS:LO EN.=NO: SF: PMS MODE	S	260005025	01011	00000000	0101000010101	J8338

P78-2 COMMAND LIST 08-18-78 REV 7 STATE = (PULSE(P), LATCHING(L), UNLATCHING(U), MOMENTARY(M), SERIAL(S), NON-REDUNDANT RELAY(R))
SC9 EXPERIMENT ***** TEST LIST : NO PARITY *****

S CMD NO.	NAME	STATE	OCTAL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
8129	3KHZ GATE=ENS:LO EN.=NO:SFPEW MODE	S	250005026	01011 00000000 0101000010110	J8528
8130	3KHZ GATE=ENS:LO EN.=NO:SFPEW MODE	S	260005027	01011 00000000 0101000010111	J8528
8131	3KHZ GATE=ENS:LO EN.=YES:NORMAL MODE	S	260005030	01011 00000000 0101000010000	J8538
8132	3KHZ GATE=ENS:LO EN.=YES:FAST ION MODE	S	260005031	01011 00000000 0101000010001	J8538
8133	3KHZ GATE=ENS:LO EN.=YES:FAST MIX MODE	S	260005032	01011 00000000 0101000010010	J8538
8134	3KHZ GATE=ENS:LO EN.=YES:SFPEW MODE	S	260005033	01011 00000000 0101000010011	J8538
8135	3KHZ GATE=ENS:LO EN.=YES:SFPEW MODE	S	260005034	01011 00000000 0101000010010	J8538
8136	3KHZ GATE=ENS:LO EN.=YES:SFPEW MODE	S	260005035	01011 00000000 0101000010011	J8538
8137	3KHZ GATE=ENS:LO EN.=YES:SFPEW MODE	S	260005036	01011 00000000 0101000010011	J8538
8138	3KHZ GATE=ENS:LO EN.=YES:SFPEW MODE	S	260005037	01011 00000000 0101000010011	J8538
8139	3KHZ GATE=PEW:LO EN.=NO:NORMAL MODE	S	260005040	01011 00000000 0101000010000	J8538
8140	3KHZ GATE=PEW:LO EN.=NO:FAST ION MODE	S	260005041	01011 00000000 0101000010001	J8538
8141	3KHZ GATE=PEW:LO EN.=NO:FAST MIX MODE	S	260005042	01011 00000000 0101000010010	J8538
8142	3KHZ GATE=PEW:LO EN.=NO:SFPEW MODE	S	260005043	01011 00000000 0101000010011	J8538
8143	3KHZ GATE=PEW:LO EN.=NO:SFPEW MODE	S	260005044	01011 00000000 0101000010010	J8538
8144	3KHZ GATE=PEW:LO EN.=NO:SFPEW MODE	S	260005045	01011 00000000 0101000010011	J8538
8145	3KHZ GATE=PEW:LO EN.=NO:SFPEW MODE	S	260005046	01011 00000000 0101000010011	J8538
8146	3KHZ GATE=PEW:LO EN.=NO:SFPEW MODE	S	260005047	01011 00000000 0101000010011	J8538
8147	3KHZ GATE=PEW:LO EN.=YES:NORMAL MODE	S	260005050	01011 00000000 0101000010000	J8538
8148	3KHZ GATE=PEW:LO EN.=YES:FAST ION MODE	S	260005051	01011 00000000 0101000010001	J8538
8149	3KHZ GATE=PEW:LO EN.=YES:FAST MIX MODE	S	260005052	01011 00000000 0101000010010	J8538
8150	3KHZ GATE=PEW:LO EN.=YES:SFPEW MODE	S	260005053	01011 00000000 0101000010011	J8538
8151	3KHZ GATE=PEW:LO EN.=YES:SFPEW MODE	S	260005054	01011 00000000 0101000010010	J8538
8152	3KHZ GATE=PEW:LO EN.=YES:SFPEW MODE	S	260005055	01011 00000000 0101000010011	J8538
8153	3KHZ GATE=PEW:LO EN.=YES:SFPEW MODE	S	260005056	01011 00000000 0101000010011	J8538
8154	3KHZ GATE=PEW:LO EN.=YES:SFPEW MODE	S	260005057	01011 00000000 0101000010011	J8538
8155	3KHZ GATE=PEW:LO EN.=NO:NORMAL MODE	S	260005060	01011 00000000 0101000010000	J8538
8156	3KHZ GATE=PEW:LO EN.=NO:FAST ION MODE	S	260005061	01011 00000000 0101000010001	J8538
8157	3KHZ GATE=PEW:LO EN.=NO:FAST MIX MODE	S	260005062	01011 00000000 0101000010010	J8538
8158	3KHZ GATE=PEW:LO EN.=NO:SFPEW MODE	S	260005063	01011 00000000 0101000010011	J8538
8159	3KHZ GATE=PEW:LO EN.=NO:SFPEW MODE	S	260005064	01011 00000000 0101000010010	J8538
8160	3KHZ GATE=PEW:LO EN.=NO:SFPEW MODE	S	260005065	01011 00000000 0101000010011	J8538
8161	3KHZ GATE=PEW:LO EN.=NO:SFPEW MODE	S	260005066	01011 00000000 0101000010011	J8538
8162	3KHZ GATE=PEW:LO EN.=NO:SFPEW MODE	S	260005067	01011 00000000 0101000010011	J8538
8163	3KHZ GATE=PEW:LO EN.=YES:NORMAL MODE	S	260005070	01011 00000000 0101000010000	J8538
8164	3KHZ GATE=PEW:LO EN.=YES:FAST ION MODE	S	260005071	01011 00000000 0101000010001	J8538
8165	3KHZ GATE=PEW:LO EN.=YES:FAST MIX MODE	S	260005072	01011 00000000 0101000010010	J8538
8166	3KHZ GATE=PEW:LO EN.=YES:SFPEW MODE	S	260005073	01011 00000000 0101000010011	J8538
8167	3KHZ GATE=PEW:LO EN.=YES:SFPEW MODE	S	260005074	01011 00000000 0101000010010	J8538
8168	3KHZ GATE=PEW:LO EN.=YES:SFPEW MODE	S	260005075	01011 00000000 0101000010011	J8538
8169	3KHZ GATE=PEW:LO EN.=YES:SFPEW MODE	S	260005076	01011 00000000 0101000010011	J8538
8170	3KHZ GATE=PEW:LO EN.=YES:SFPEW MODE	S	260005077	01011 00000000 0101000010011	J8538
8171	3KHZ GATE=PEW:LO EN.=NO:NORMAL MODE	S	260005100	01011 00000000 0101000010000	J8538
8172	3KHZ GATE=PEW:LO EN.=NO:FAST ION MODE	S	260005101	01011 00000000 0101000010001	J8538
8173	3KHZ GATE=PEW:LO EN.=NO:FAST MIX MODE	S	260005102	01011 00000000 0101000010010	J8538
8174	3KHZ GATE=PEW:LO EN.=NO:SFPEW MODE	S	260005103	01011 00000000 0101000010011	J8538
8175	3KHZ GATE=PEW:LO EN.=NO:SFPEW MODE	S	260005104	01011 00000000 0101000010010	J8538
8176	3KHZ GATE=PEW:LO EN.=NO:SFPEW MODE	S	260005105	01011 00000000 0101000010011	J8538
8177	3KHZ GATE=PEW:LO EN.=NO:SFPEW MODE	S	260005106	01011 00000000 0101000010010	J8538
8178	3KHZ GATE=PEW:LO EN.=NO:SFPEW MODE	S	260005107	01011 00000000 0101000010011	J8538

A-100

S CMD NO.	NAME	STATE	CTCL	BINARY BITS 6-32	TM VERIFICATION AND REFERENCE
8229	3KHZ GATE= :LO EN.=YES:FAST MIX MODE S	260005172	01011	00000000 0101001111010	J8538
8230	3KHZ GATE= :LO EN.=YES:SPNS MODE S	260005173	01011	00000000 0101001111011	J8538
8231	3KHZ GATE= :LO EN.=YES:SPNS MODE S	260005174	01011	00000000 0101001111100	J8538
8232	3KHZ GATE= :LO EN.=YES:SPNS MODE S	260005175	01011	00000000 0101001111101	J8538
8233	3KHZ GATE= :LO EN.=YES:SPNS MODE S	260005176	01011	00000000 0101001111110	J8538
8234	3KHZ GATE= :LO EN.=YES:SPNS MODE S	260005177	01011	00000000 0101001111111	J8538
8235	3K MODE=AUTO:MOTOR PWR: EN=OFF,NS=OFF S	260005400	01011	00000000 01010000000	J8539
8236	3K MODE=AUTO:MOTOR PWR: EN=OFF,NS=78.1 S	260005401	01011	00000000 01010000000	J8539
8237	3K MODE=AUTO:MOTOR PWR: EN=OFF,NS=62.5 S	260005402	01011	00000000 01010000000	J8539
8238	3K MODE=AUTO:MOTOR PWR: EN=OFF,NS=125 S	260005403	01011	00000000 01010000000	J8539
8239	3K MODE=AUTO:MOTOR PWR: EN=78.1,NS=OFF S	260005410	01011	00000000 01010000000	J8539
8240	3K MODE=AUTO:MOTOR PWR: EN=78.1,NS=78.1 S	260005411	01011	00000000 01010000000	J8539
8241	3K MODE=AUTO:MOTOR PWR: EN=78.1,NS=62.5 S	260005412	01011	00000000 01010000000	J8539
8242	3K MODE=AUTO:MOTOR PWR: EN=72.1,NS=125 S	260005413	01011	00000000 01010000000	J8539
8243	3K MODE=AUTO:MOTOR PWR: EN=62.5,NS=OFF S	260005420	01011	00000000 01010000000	J8539
8244	3K MODE=AUTO:MOTOR PWR: EN=62.5,NS=78.1 S	260005421	01011	00000000 01010000000	J8539
8245	3K MODE=AUTO:MOTOR PWR: EN=62.5,NS=62.5 S	260005422	01011	00000000 01010000000	J8539
8246	3K MODE=AUTO:MOTOR PWR: EN=62.5,NS=125 S	260005423	01011	00000000 01010000000	J8539
8247	3K MODE=AUTO:MOTOR PWR: EN=117,NS=OFF S	260005430	01011	00000000 01010000000	J8539
8248	3K MODE=AUTO:MOTOR PWR: EN=117,NS=78.1 S	260005431	01011	00000000 01010000000	J8539
8249	3K MODE=AUTO:MOTOR PWR: EN=117,NS=62.5 S	260005432	01011	00000000 01010000000	J8539
8250	3K MODE=AUTO:MOTOR PWR: EN=117,NS=125 S	260005433	01011	00000000 01010000000	J8539
8251	3K MODE=LOW:MOTOR PWR: EN=OFF,NS=OFF S	260005500	01011	00000000 01010100000	J8539
8252	3K MODE=LOW:MOTOR PWR: EN=OFF,NS=78.1 S	260005501	01011	00000000 01010100000	J8539
8253	3K MODE=LOW:MOTOR PWR: EN=OFF,NS=62.5 S	260005502	01011	00000000 01010100000	J8539
8254	3K MODE=LOW:MOTOR PWR: EN=OFF,NS=125 S	260005503	01011	00000000 01010100000	J8539
8255	3K MODE=LOW:MOTOR PWR: EN=78.1,NS=OFF S	260005510	01011	00000000 01010100000	J8539
8256	3K MODE=LOW:MOTOR PWR: EN=78.1,NS=78.1 S	260005511	01011	00000000 01010100000	J8539
8257	3K MODE=LOW:MOTOR PWR: EN=78.1,NS=62.5 S	260005512	01011	00000000 01010100000	J8539
8258	3K MODE=LOW:MOTOR PWR: EN=78.1,NS=125 S	260005513	01011	00000000 01010100000	J8539
8259	3K MODE=LOW:MOTOR PWR: EN=62.5,NS=OFF S	260005520	01011	00000000 01010100000	J8539
8260	3K MODE=LOW:MOTOR PWR: EN=62.5,NS=78.1 S	260005521	01011	00000000 01010100000	J8539
8261	3K MODE=LOW:MOTOR PWR: EN=62.5,NS=62.5 S	260005522	01011	00000000 01010100000	J8539
8262	3K MODE=LOW:MOTOR PWR: EN=62.5,NS=125 S	260005523	01011	00000000 01010100000	J8539
8263	3K MODE=LOW:MOTOR PWR: EN=117,NS=OFF S	260005530	01011	00000000 01010100000	J8539
8264	3K MODE=LOW:MOTOR PWR: EN=117,NS=78.1 S	260005531	01011	00000000 01010100000	J8539
8265	3K MODE=LOW:MOTOR PWR: EN=117,NS=62.5 S	260005532	01011	00000000 01010100000	J8539
8266	3K MODE=LOW:MOTOR PWR: EN=117,NS=125 S	260005533	01011	00000000 01010100000	J8539
8267	3K MODE=HIGH:MOTOR PWR: EN=OFF,NS=OFF S	260005600	01011	00000000 01011000000	J8539
8268	3K MODE=HIGH:MOTOR PWR: EN=OFF,NS=78.1 S	260005601	01011	00000000 01011000000	J8539
8269	3K MODE=HIGH:MOTOR PWR: EN=OFF,NS=62.5 S	260005602	01011	00000000 01011000000	J8539
8270	3K MODE=HIGH:MOTOR PWR: EN=OFF,NS=125 S	260005603	01011	00000000 01011000000	J8539
8271	3K MODE=HIGH:MOTOR PWR: EN=78.1,NS=OFF S	260005610	01011	00000000 01011000000	J8539
8272	3K MODE=HIGH:MOTOR PWR: EN=78.1,NS=78.1 S	260005611	01011	00000000 01011000000	J8539
8273	3K MODE=HIGH:MOTOR PWR: EN=78.1,NS=62.5 S	260005612	01011	00000000 01011000000	J8539
8274	3K MODE=HIGH:MOTOR PWR: EN=78.1,NS=125 S	260005613	01011	00000000 01011000000	J8539
8275	3K MODE=HIGH:MOTOR PWR: EN=62.5,NS=OFF S	260005620	01011	00000000 01011000000	J8539
8276	3K MODE=HIGH:MOTOR PWR: EN=62.5,NS=78.1 S	260005621	01011	00000000 01011000000	J8539
8277	3K MODE=HIGH:MOTOR PWR: EN=62.5,NS=62.5 S	260005622	01011	00000000 01011000000	J8539
8278	3K MODE=HIGH:MOTOR PWR: EN=62.5,NS=125 S	260005623	01011	00000000 01011000000	J8539

S CMD NO.	NAME	STATE	OCTAL	BINARY EITS 6-32	TJ VERIFICATION AND REFERENCE
8279	3K MODE=HIGH:MOTOR PWR: EW=117, NS=OFF	S	260005630	01011 00000000 0101110011000	J8539
8280	3K MODE=HIGH:MOTOR PWR: EW=117, NS=78.1	S	260005631	01011 00000000 0101110011001	J8539
8281	3K MODE=HIGH:MOTOR PWR: EW=117, NS=62.5	S	260005632	01011 00000000 0101110011010	J8539
8282	3K MODE=HIGH:MOTOR PWR: EW=117, NS=125	S	260005633	01011 00000000 0101110011011	J8539
8283	NORTH SOUTH POSITION STATUS, 255	S	260002377	01011 00000000 01001111111	J4014, J4017
8284	EAST WEST POSITION STATUS, 255	S	260002777	01011 00000000 01011111111	J4015, J4018
8285	DWELL/CYCLE = 255	S	260003777	01011 00000000 01111111111	J8533
8286	INITIAL DWELL STEP = 255	S	260004377	01011 00000000 01001111111	J8534
8287	DWELL STEP SIZE = 0	S	260004400	01011 00000000 01001000000	J8535
8288	DWELL STEP SIZE = 255	S	260004777	01011 00000000 01001111111	J8535
8289	ACCUMULATOR GATING = 255	S	260005377	01011 00000000 01010111111	J8538
8290	MOTOR POWER = 255	S	260005777	01011 00000000 01011111111	J8539
8291	LEHLEI-DSS 0	S	260004500	01011 00000000 01001010000	J8535 LC 124-42
8292	LEHLEI-DSS 1	S	260004501	01011 00000000 01001010001	J8535 LC 124-42
8293	LEHLEI-DSS 2	S	260004502	01011 00000000 010010100010	J8535 LC 124-42
8294	LEHLEI-DSS 4	S	260004504	01011 00000000 010010100100	J8535 LC 124-42
8295	LEHLEI-DSS 8	S	260004510	01011 00000000 0100101001000	J8535 LC 124-42
8296	LEHLEI-DSS 16	S	260004520	01011 00000000 01001010010000	J8535 LC 124-42
8297	LEHLEI-DSS 32	S	260004540	01011 00000000 0100101100000	J8535 LC 124-42

APPENDIX 8

STATUS WORD MAP

SC-2 STATUS DATA STRUCTURE

WORD 106

MSB

WFRAME

2087

2086

2085

2084

2083

2082

2081

LSF

WFRAME

MSB

2087

2086

2085

2084

2083

2082

2081

LSB

2080

SC-2 STATUS DATA STRUCTURE

WORD 106

MSB

WFRAME

2087

2086

2085

2084

2083

2082

2081

LSB

2080

APPENDIX 9

Calibration of Experiment SC9 on
Satellite P78-2

This document describes the current state of the calibration as of 28 February 1981 of experiment SC-9 on satellite P78-2.

1. IONS

Both the ion and electron guns use multichannel differential electrostatic analyzers. We have been using the geometric factor (G) and conversion factor (H) from ATS-6;

$$G = 1.6 \times 10^{-3} \text{ cm-cm-sterad}$$

$$H = G * (\Delta E)/E = 0.2 * G$$

An energy dependent efficiency is added to this conversion factor at low energies due to the post-analysis acceleration of particles between the focussing lens and the spiraltron detector to give the complete conversion factor. This occurs gradually around 1-3 keV for the ions (fig. 1.1). The efficiency variations are described by

$$\text{eff(ions)} = 1 + 2/[1 + (E(\text{keV})/1.5)^3]$$

and the corrected count rate is (raw count rate)/eff(ion).

Data was compared between SC-2, SC-5 and SC-9 to test for agreement. The ion data appeared to agree well over the entire range of overlapping energies (fig. 1.2, 1.3).

2. Energy Corrections

In the high energy (North/South) detectors the actual voltage on the analyzer plates differs from the nominal voltage

$$E_0 = -21 + 15.1 * (1.145^S)$$

where S is the step number ($0 \leq S \leq 63$). One must take into account a temperature dependent transient response voltage which occurs following the transition from a high energy step to a low energy step. When the analyzer voltage drops from a high value to a low value a voltage offset occurs. This offset is unpredictable for the first 1/4 to 1/2 second and then decays away with a $1/(t+c)$ response, where t is the time after the transition. In order to compensate for this effect we must add a temperature dependent correction term to E_0 .

$$E = E_0 + C1 * [1/(4t+1) + 1/[4 * (\text{dwell time}) + 65]] - 1/97$$

where C1 has the form

$$C1 = A + B * \exp(C * T)$$

The constants A, B and C were determined using the high energy electron data. During a very low energy dwell the analyzer energy will sweep through the photoelectron spike and a C1 value can be chosen to fit the dwell spectrum to the scan spectrum which follows it. The fit was done for temperatures of 8, 13 and 17 degrees centigrade, and the values were determined to be

$$A = 18.3 \quad B = 0.43 \quad C = 0.05$$

More work to determine these values more precisely would be desirable, and probably will be undertaken as software development permits.

3. Analog Voltage Determination of Detector Angles

There are two methods of determining the position of the rotating de-

tector assemblies, a digital step counter and an analog voltage. The step counter is normally more accurate, but when the detector sticks the voltage must be used to determine the detector angle.

We looked for days when the heads were rotating without sticking at various temperatures in order to cross-calibrate these two methods. We plotted voltage against Angle(step counter) (see fig 3.1), assuming a standard curve at 21 degrees (fig 3.2). A straight-line-segment fit was made to this curve. The assumption was made that the temperature shifted the standard curve linearly, proportional to the voltage.

A hysteresis problem is apparent in figure 3.1, for the voltage as the detector moves up is not the same as the voltage at the same position as it swings back the other way. This is at present unexplained. The effect is small enough to allow us to use the piecewise-linear fit we have obtained and yet is annoying enough to merit some future consideration.

4. Electrons

The analysis for electrons is similar to that for ions. The geometric factor has been halved by placing a plate over the detector aperture to prolong the useful life of the spiraltron. This is necessary because the electron sensors are subject to much higher counting rates than are the ion sensors. The expression for lens efficiency is

$$\begin{aligned} \text{eff} &= \Lambda/C \\ C &= 1 \quad ; E < 100 \text{ eV} \\ C &= 1 + 50/E(\text{eV}) \quad ; E > 100 \text{ eV} \\ A &= 1 + 2/[1 + (E(\text{keV})/.15)**3] \end{aligned}$$

C takes into account the fact that the suppressor voltage is turned on at 100 eV to exclude secondary electrons and other background producing particles.

The electron detectors must also take into account the spiraltron efficiency. We use the calibration curve of Archuleta and DeForest (1971) that was obtained for the instrument that flew on ATS-5. They found that the efficiency was approximately constant for ions, and for electrons the following was a good fit to the data.

$$\begin{aligned} \text{eff}(\text{spi}) &= 1 - 2/B \\ B &= 3 + 6.5 [.2 + E(\text{keV})] + 30/[.2 + E(\text{keV})]**3 \end{aligned}$$

The total conversion factor as a function of energy is shown in figure 1.1. The corrected count rate is given by

$$\text{CR}(\text{corrected}) = \text{CR}(\text{raw})/[\text{eff}(\text{spi})*\text{eff}(\text{lens})]$$

Comparison of our data with that of other instruments in the same energy range reveals that when comparing distribution functions we were higher by factors on the order of 5 to 10 (figures 1.2, 4.1). The high count rates seem to indicate that these are real discrepancies that can't be explained as fluctuations. It is necessary to look at all three instruments and examine the possible causes for these differences.

a) spiraltron degradation

Several of the bias tests that had been run were analyzed to try to get a handle on the problem of spiraltron degradation. The detectors have four allowable bias levels. They allow us to vary the voltage applied across the spiraltrons and so vary their sensitivity.

A bias test is designed to run through a series of bias levels in a constant environment, allowing us to determine if an increased bias level results in an increased counting rate. If not, all the particles are being measured. If so, the instrument is degraded somewhat, and we can normalize our counts to the highest bias level.

Usable bias tests were run on days 39, 179, 201 and 278. Scans were plotted for each bias level and the spectral shift was estimated. More work needs to be done in this area. Cross-calibration with the other instruments will allow us to make the bias data absolute, rather than merely relative to our highest bias level. Also, long-term averaging of electron count rates could be done to show us the overall fall off in spiraltron sensitivity.

b) spiraltron calibration

Hardy claims to have obtained a significantly different calibration curve than that of Archuletes and DeForest while calibrating his instrument. The possibility exists that our spiraltron calibration curve might be wrong. Perhaps mutual normalization of SC-2, SC-5 and SC-9 is the way to approach this; we could get numbers that we could agree on even if they were not correct in the absolute sense.

c) geometric factors

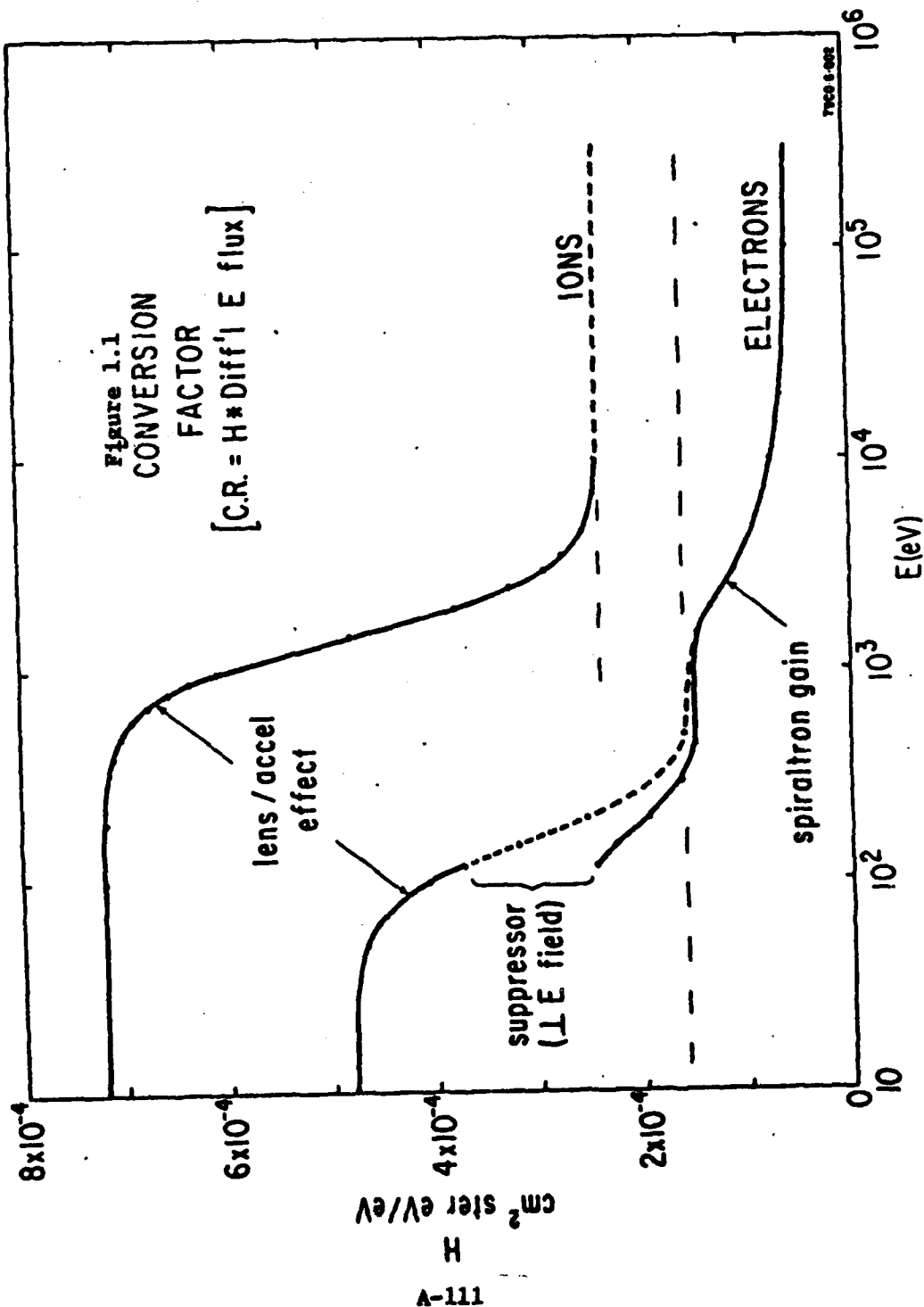
It is desirable to verify that the geometric factor that we are using is correct. One method of doing this is to search our data set for cases where the spacecraft charges after becoming eclipsed. If we assume that the environment is constant, we will see the same spectrum shifted in energy. If we can find these situations it will allow us to compare our calibration at different energies and so verify our geometric factor.

5. Sun Pulses

The problem of sun pulses should also be addressed. Our instrument gives us high count rates when pointing in the direction of the sun. Figure 5.1 shows this effect. The stars represent data taken while our instrument is looking at the hemisphere towards the sun, the circles that data taken while the instrument was pointing away from the sun. The added counts due to the sun can be seen in the angle dependent deviation from the actual spectrum defined by the circles in the data taken while we were pointing towards the sun.

We need to extend our software to extract the sun angle from the attitude information. We can then look through a statistically significant number of cases to determine the response of our detector as a

function of sun angle. If this is constant over time we could then subtract out the "average sun response" from our data as appropriate.



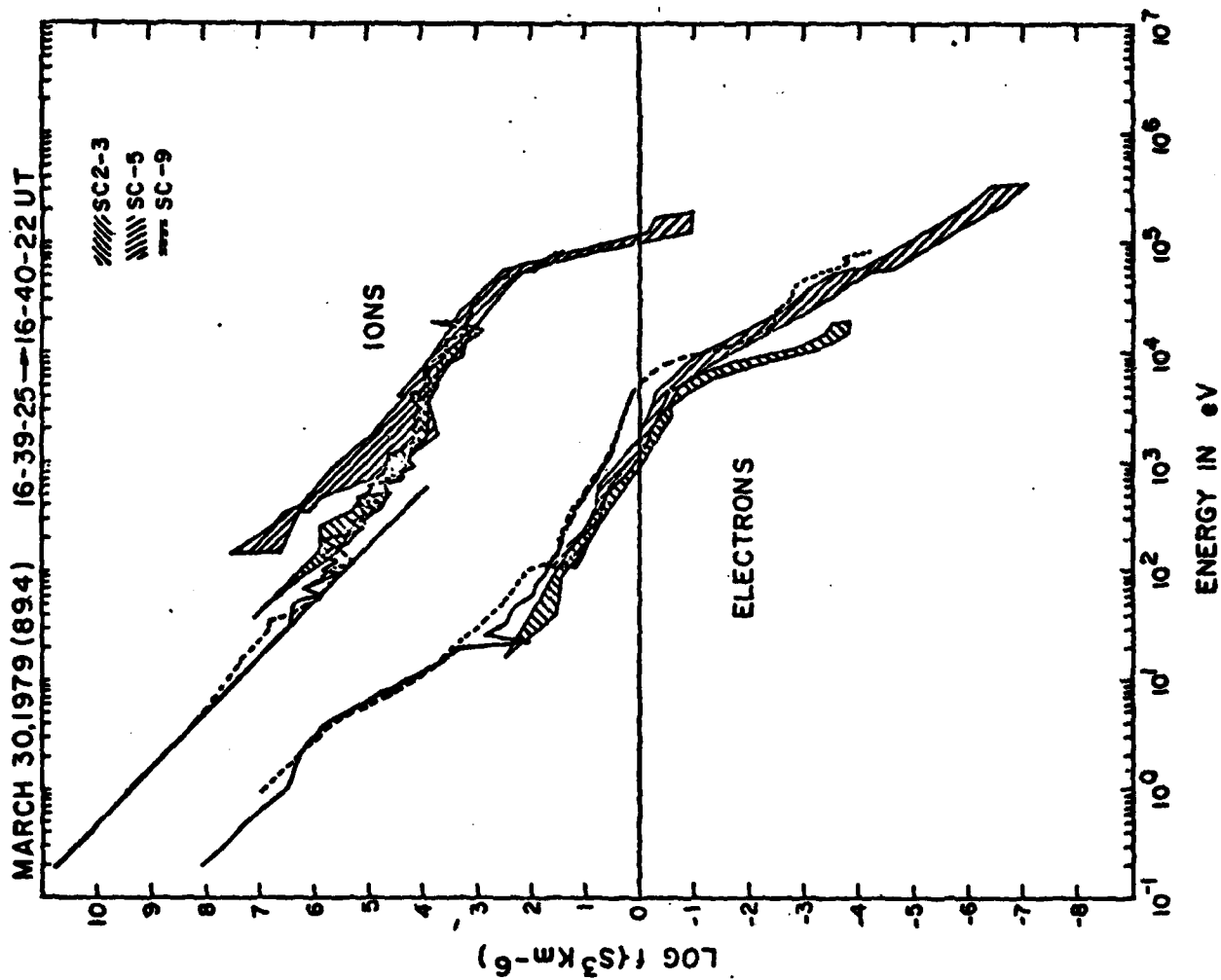


Fig. 1.2 from a comparison of SC2-3, SC-5 and SC-9
Prepared by M. S. Gussenhoven

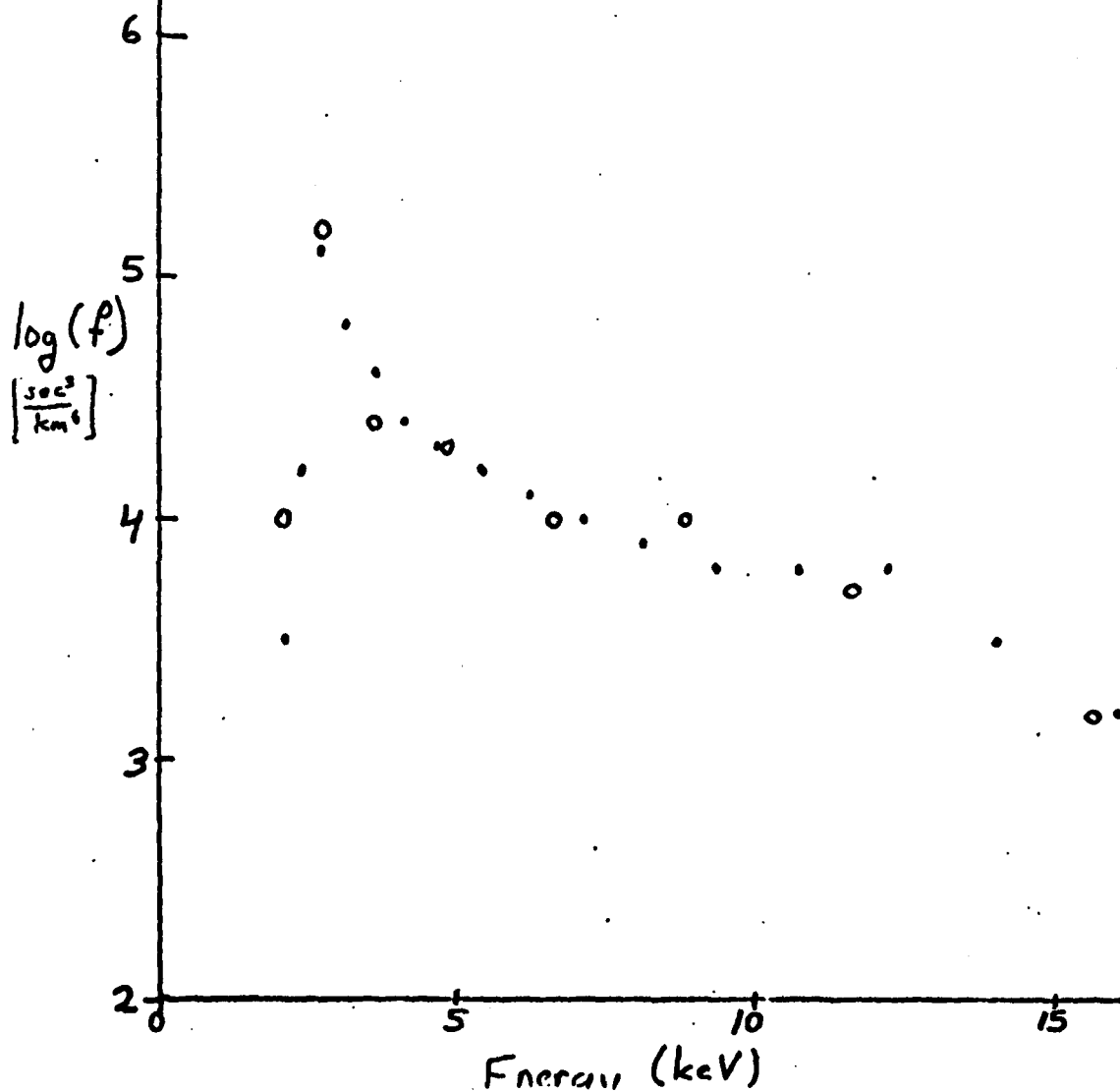
Figure 1.3

Ion distribution functions

• SC-9 NS detector

○ SC2-3

data taken with pitch angle $\leq 90^\circ$
1710 UT Day 87, 1979



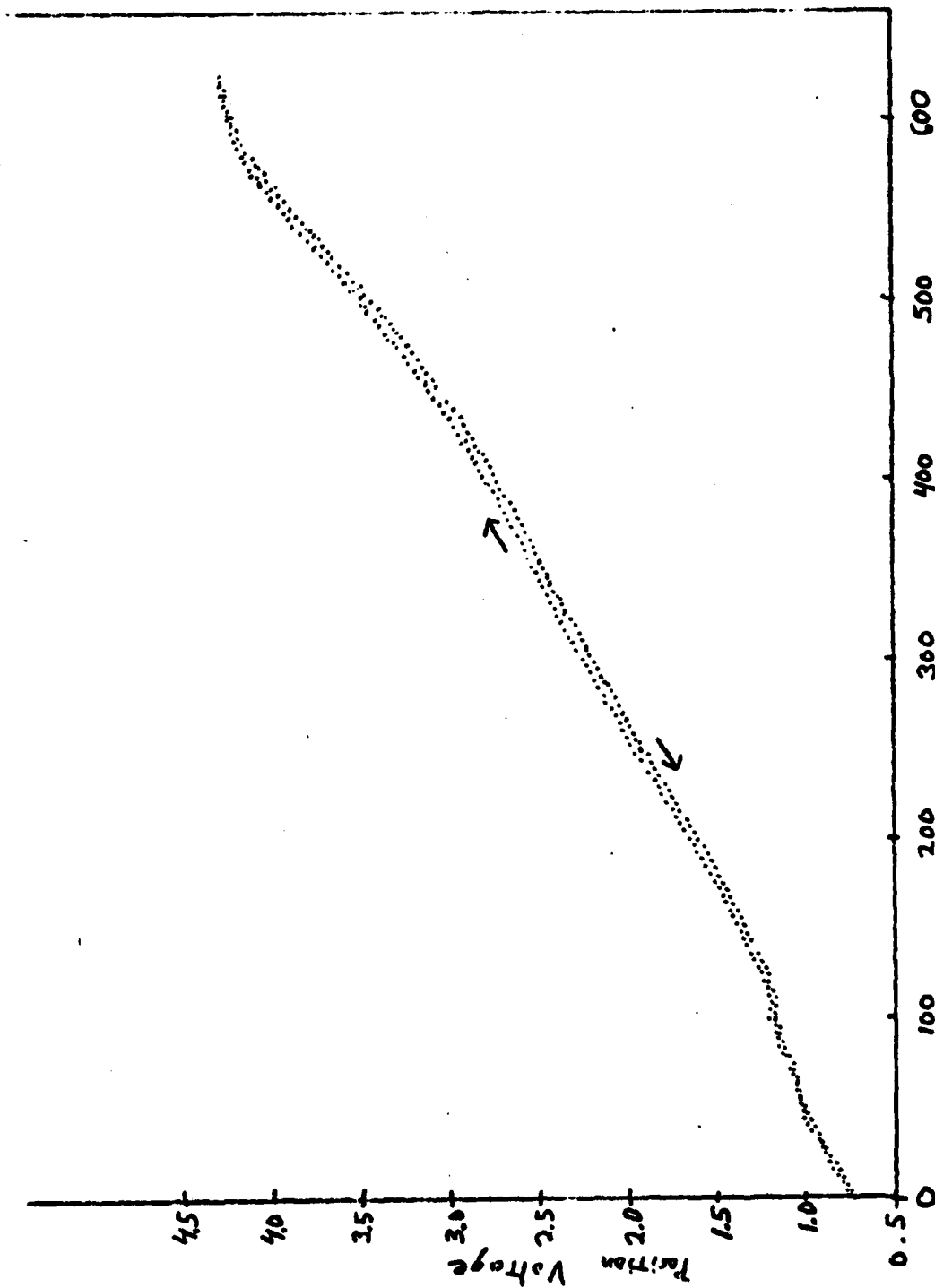


Figure 3.1 Correlation between Analog and digital methods of detector angle determination

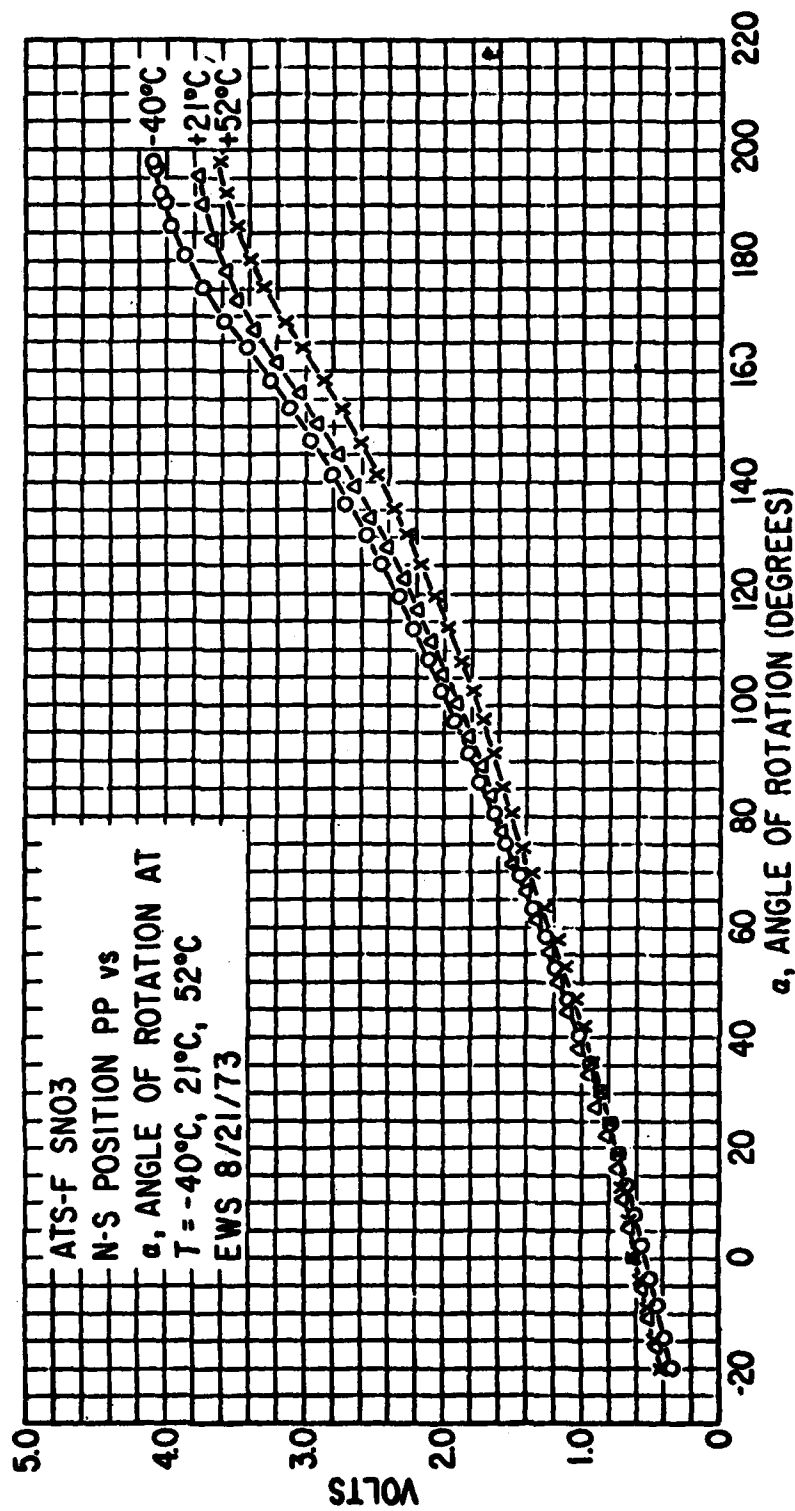
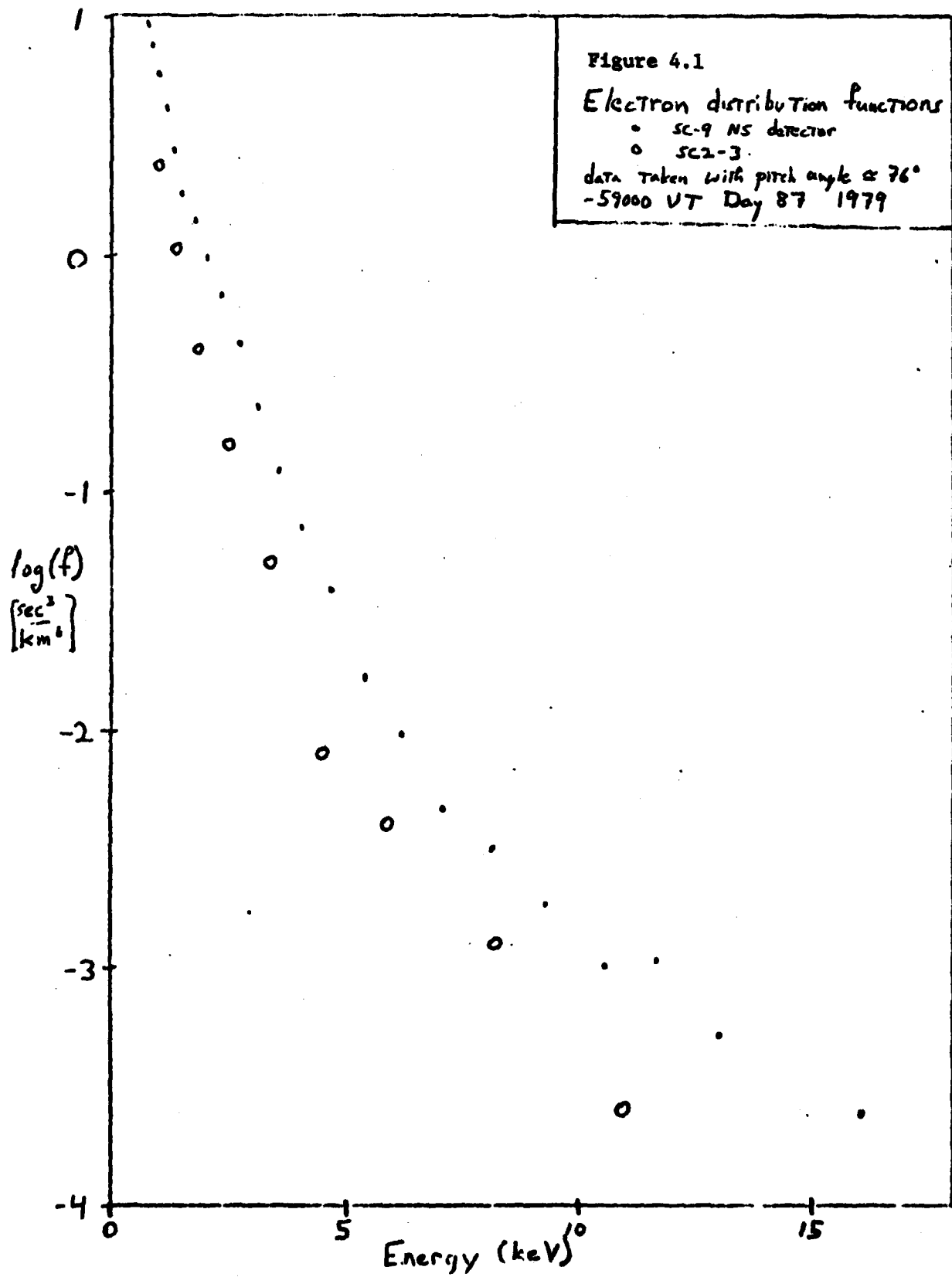


Figure 3.2



DAY: 178/79

80417-81601

NSElectrons

$E = 10683.8 \text{ eV}$

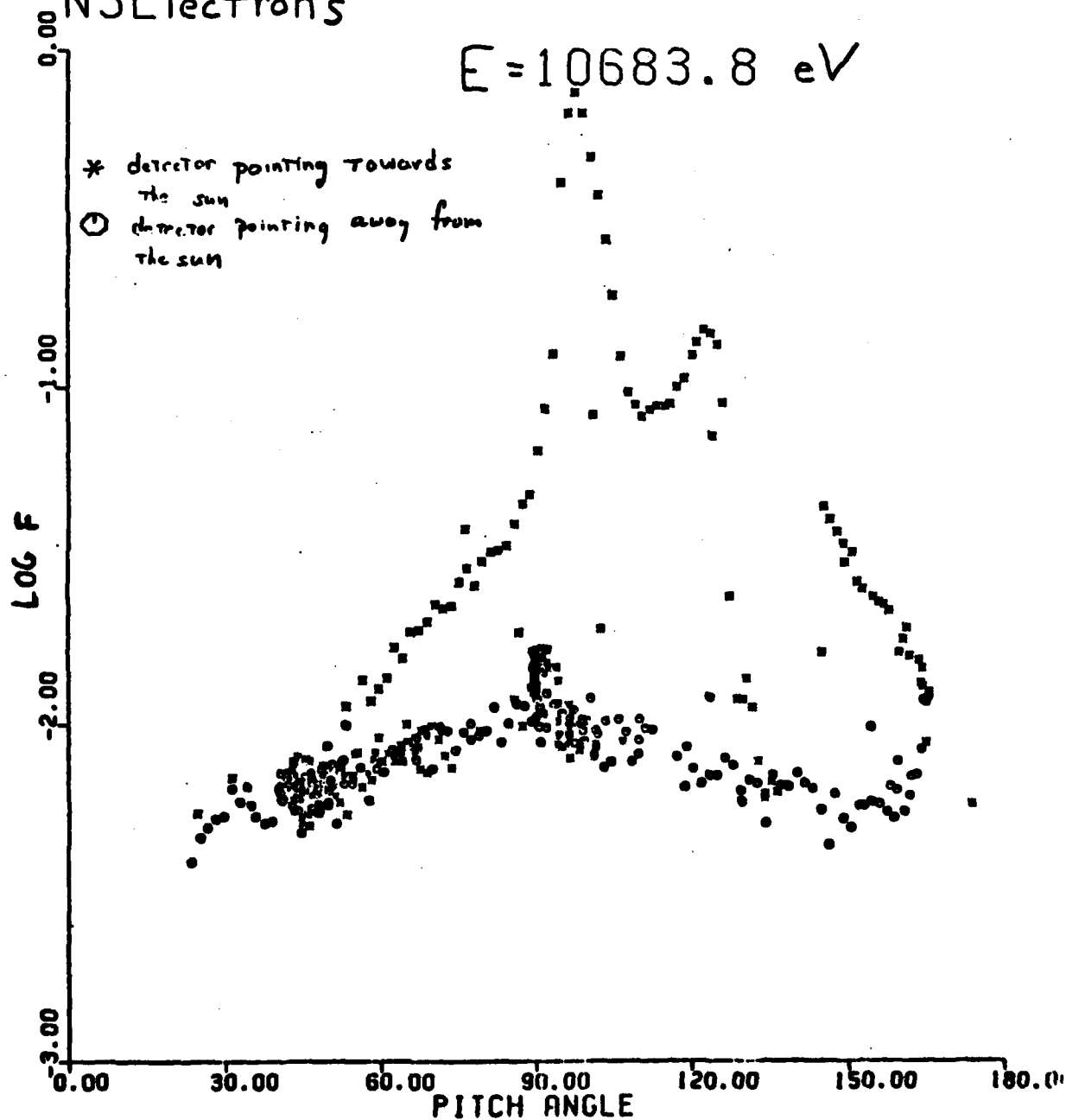


Figure 5.1 Sun Pulse Contaminated Spectrum