This ATM has been prepared to document test plans for acceptance tests on the SIDE/CCGE Engineering Model. These plans cover only subsystem tests on this model and are also applicable to the prototype.

SEE PAGE 12 GENERAL INFORMATION

Prepared by: D. Perkins

D. Perkins

Approved by: A. B. Collins

A. B. Collins

Approved by: Jack E. Dye

Jack E. Dye

Test Plan for Acceptance Tests at BxA on SIDE/CCGE Engineering Model

1. Purpose

The purpose of this document is to define the tests which must be carried out on the SIDE/CCGE Engineering Model at BxA prior to acceptance of the experiment at BxA and integration into ALSEP. This document covers the Engineering Model and prototype tests on the experiment as a subsystem. System level tests are defined elsewhere.

2. Scope

The tests described herein are the minimum which will be accomplished prior to integration of the experiment into ALSEP. Also, if the experiment is removed from the system test due to any known or suspected malfunction, these tests will normally be run prior to re-integration of the experiment into ALSEP. However, it is not mandatory that this complete test sequence be re-run, depending on the nature of the malfunction.

3. Applicable Documents

The following documents are applicable to this test plan to the extent referenced herein.

1. Interface Control Specification for Suprathermal Ion Detector Experiment for Apollo Lunar Surface Experiments Package System, ICS 314105.

2. Rice/Marshall Laboratories Acceptance Data Package for SIDE/CCGE Engineering Model.

3. Rice/Marshall Laboratories Operating and Maintenance Manual for Experiment Test Set for SIDE/CCGE.

4. Test Personnel

These tests shall be conducted under the supervision of the BxA Project Engineer for SIDE/CCGE, or someone personally appointed by him. It is highly desirable (but not mandatory) that a PI representative, either from Rice University or from Marshall Laboratories be present during these tests. The Test Supervisor shall be the judge of whether or not the experiment has satisfactorily passed these tests. However, he shall consult with the PI representative in making this judgment, and shall, to the extent possible without impacting test schedules, re-run any tests that the PI representative believes were unsatisfactory.

Additional personnel may participate in or witness these tests only with the approval of the Test Supervisor.

5. Equipment and Facilities Required

a. A SIDE/CCGE Engineering Model - (Note - the SIDE/CCGE breadboard may be used instead of the engineering model, assuming that it provides the same electrical interfaces, power requirements, response to commands, etc. as would the engineering model.

If the SIDE/CCGE breadboard is used, it shall only be used as an interim test device until the SIDE/CCGE engineering model is available).

b. SIDE/CCGE Experiment Test Set

c. Tecktronix oscilloscope or equivalent

d. Hewlett-Packard scope camera or equivalent

e. Hewlett-Packard VTVM or equivalent

f. Floor space adequate for a desk of equipment (which will comprise the ETS) and the appendage vacuum system (about 2' x 2').

g. Laboratory power, nominal 115 VAC, 60 cps, 30 amps.

6. Test Sequence

Tests shall be carried out in accordance with the procedure contained herein. Expected parameter values and allowable tolerances, which will be used as the basis for judging whether the experiment has successfully passed a specific test, are defined as part of the test procedure.

7. Place of Tests

All tests will be conducted at Bendix Aerospace Systems Division.

8. Test Procedure and Recording of Results

A test procedure, containing a test record format, will be prepared for use during the tests. The test results will be recorded and kept on file at Bendix Aerospace Systems Division. Copies of the test results will be furnished to the PI's and MSC as soon as possible after completion of the tests.

9. Lockout Plugs

9.1 When the experiment is not operated in a vacuum, the high voltages, 4.5 kv and -3.5 kv, must be inhibited. A special connector is provided which causes the high voltage circuits and seal break circuit to be inoperative.

9.2 When operated in a vacuum, the seal break command must still be inhibited using a lock-out plug.

TEST	PARAMETER	TEST CONDITIONS	TEST INPUT	TEST OUTPUT	DATA RECORDING	LIMITS
SCA-1.1	Return Line Isolation	Experiment disconnected from ETS. Measurements at Expt. Jumper Cable Connector Lockout Plug Connected		Measure resistance between following points SG RET (pin r) to shields pins W, j, i S, R, N SG RET (pin r) to power return pins J, C, p, G, n, F, Z, Y, D Shields pins W, j, i, S, R, N to power returns pins J, c, p, G, n, F, Z, Y D	Record Values	Greater than 10^6 ohms
SCA-1.2	Return Line Isolation	Experiment Connected to ETS. Power OFF		Measure resistance from EX GRD to AL GRD and HP RET	Record Values	Greater than 10^6 ohms
SCA-1.3	Heater Return Isolation	Power OFF. ALSEP simulator cable disconnected		Measure resistance from HP RET to OP RET	Record Values	Greater than 10^6 ohms
SCA-2	Operating Power	Ensure Lockout Plug Connected Experiment Connected to ETS				
	Voltage	Power ON		Measure 29 volt operating line at ETS using DVM	Record Value	29 ± 1 volts
	Current			Measure current on ETS current meter	Record Value	150 to 235 mA
	Experiment Voltages	Use selector switch and DVM on ETS Monitor Unit		Measure +60 volts	Record Value	58.2 to 61.8 volts
				Measure -30 volts	Record Value	-29.1 to -30.9 volts
				Measure +30 volts	Record Value	+29.1 to 30.9 volts
				Measure +5 volts	Record Value	4.85 to 5.15 volts
				Measure -5 volts	Record Value	-4.85 to -5.15 volts
				Measure +12 AL volts	Record Value	11.4 to 12.6 volts
				Measure -5 AL volts	Record Value	4.85 to 5.15 volts
				Measure -12 AL volts	Record Value	-11.4 to -12.6 volt
	Heater Power	Switch Exp. OFF Switch Heater Power ON		Measure increase in current on ETS meter	Record Value	Less than 52 mA
SCA-3	Electrical Interface	Measure with respect to signal return		Display waveforms on ETS oscilloscope		
	Shift Pulse				Measure amplitude and repetition rate	Low level 0 to 0.4 V high 2.5 to 5.5 V 1060 pulses per second
	Demand Pulse				Measure amplitude and width	Low level 0 to 0.4 V high 2.5 to 5.5V 9.4 millisec.
	Even Frame Mark				Measure amplitude width and repetition rate	Low level 0 to 0.4 V high 2.5 to 5.5V 118 μ sec. width, 1.2 secs. rep. rate

TEST	PARAMETER	TEST CONDITIONS	TEST INPUT	TEST OUTPUT	DATA RECORDING	LIMITS
SCA-3	Digital Data				Measure Amplitude	Low level to 0.4V high 2.5 to 5.5V
	Command #1		SIDE Command A		Measure amplitude and width	Inactive level 2.5 to 5.5V
	Command #2		SIDE Command B		Measure amplitude and width	Active Level 0 to 0.4V
	Command #3		SIDE Command C		Measure amplitude and width	Width 20 ± mS
	Command #4		SIDE Command D		Measure amplitude and width	
	Command #5		SIDE Command E		Measure amplitude and width	
SCA-4	Digital Data Output	Data tape print out. Reset SIDE Expt. by turning expt. power OFF then ON Lockout Plug Connected		Print one cycle of data (128 SIDE frames)	Word 1, SIDE frame counter	0, 1, 2, 3, etc. to 127
					Word 2, analog subcom	See Table 1
					Word 3, HECPA volts	See Table 3
					Word 4 & 5, HE data	Zero
					Word 6, status	See Table 1
					Word 7, Vel. Fil. volts	See Table 4
					Word 8, LECPA volts	See Table 2
					Word 9 & 10, LE data	Zero
SCA-5	Command System	Data displayed on NIXIE tubes on ETS.				
SCA-5.1	Command 3 (reset SIDE frame at 39)	Execute command	1. SIDE commands A and B 2. SIDE command E	Word 6, command input register	Check CIR at appropriate SIDE frame word 6	003 (see table 2)
				Word 6, CIR, MR and GPS	Print 24 cycles of data	
				Word 1, frame counter	Check CIR word 6 frame 1	000
				Word 2, GPV	Check MR word 6 frame 3	003
					Check GPS word 6 frame 0	see Table 7
					Check word 1 all frames	counts 0 to 39
					Check GPV word 2 frame 13	see Table 7

TEST	PARAMETER	TEST CONDITIONS	TEST INPUT	TEST OUTPUT	DATA RECORDING	LIMITS
SCA-5.2	Command 1 (ground plane stepper ON/OFF)	Data output on ETS NIXIE tube indicators	1. SIDE Command A	Word 6 CIR	Check CIR word 6 appropriate SIDE frame	001 (see table)3)
			2. SIDE command E	Word 6 CIR	" " "	000
				Word 6 MR	" " "	001
			3. SIDE Commands A, B, & E	Word 6 GPS	Check GPS word 6 frame 0	Stepper must not step
				Word 2 GPV	Check GPV word 2 frame 13 Check both over at least 2 cycles of data	voltage must not change from value obtained prior to sending command E (item 2) ±3 counts
			4. SIDE commands A & E	Word 6 GPS	Check GPS word 6 frame 0	GPS to conform to Table 7
			SIDE commands A, B, & E	Word 6 GPV	Check GPV word 2 frame 13	GPV to conform to Table 7 Do not check all steps again
SCA-5.3	Command 2 (reset SIDE frame counter at 10) (one time command 2, CCIG Seal Break)	Initialize system Lockout Plug Connected	1. Turn Expt. 29V power OFF, then ON			
			2. SIDE command B	Word 6 CIR	Check CIR word 6 frame 1	002
				Word 6 Dust cover & seal	Check word 6 frame 7	003
			3. SIDE command E	Word 6 CIR and MR	Check CIR word 6 frame 1	000
				Word 6 Dust cover & seal	Check MR word 6 frame 3	002
				Word 1 SIDE frame counter	Check word 6 frame 7	001
					Check word 1 all frames	counts 0 to 10
SCA-5.4	Command 4 (reset velocity filter counter at 9)		1. SIDE command C	Word 6 CIR	Check CIR word 6	004
			2. SIDE command E	Word 6 CIR and MR	Print one cycle of data	
				Word 7 Vel. Filter	(128 SIDE frames)	
				Word 8 LECPA volts	Check CIR word 6	000
				Word 2 dust cover and seal	Check MR word 6	004
				1 time command register status	Check Vel. FL word 7	see table 5
					Check LECPA word 8	see table
					Check word 2 frames 67, 71,	188
					Check word 2 frames 33, 35, 97, 99	163

TEST	PARAMETER	TEST CONDITIONS	TEST INPUT	TEST OUTPUT	DATA RECORDING	LIMITS
SCA-5.5	Command 5 (reset SIDE frame counter at 79)		1. SIDE commands A and C	Word 6 CIR	Check CIR word 6 frame 1	005
			2. SIDE commandE	Word 6 CIR MR	Check CIR word 6 frame 1	000
				Word 1 SIDE frame counter	Check MR word 6 frame 15	005
					Check word 1 all frames	count0 to 79
SCA-5.6	Command 6 (reset SIDE frame counter at 79 and velocity filter at 9)		1. SIDE commands B and C	Word 6 CIR	Check CIR word 6 in a convenient frame	006 (see table 2)
				Word 6 CIR, MR	Print 81 frames of data	
				Word 1 SIDE frame counter	Check CIR word 6 frame 1	000
				Word 7 Vel. Fil volts	Check MR word 6 frame 3	006
					Check word 1 all frames	count o to 79
					Check Vel. Fil word 7	see table 5
SCA-5.7	Command 8 (master reset) (one time command 4 blow dust cover)		1. SIDE command D	Word 6 CIR	Check CIR word 6 in a convenient frame	008 (see table 2)
			2. SIDE command E	Word 6 CIR MR	Print are cycle of data (128 SIDE frames)	
				Word 1 SIDE frame counter		
				Word 2 Dust Cover and Seal Status	Check CIR word 6 frame 1	000
				Word 2 One time command register status	MR word 6 frame 3 word 1 all frames	008 resets to zero; counts 0 to 127
				Dust Cover Removal	dust cover and seal status word 2 frames 67 and 71	048
					word 6 frame 7	000
					word 2 frames 33, 35, 97, 99	203
					Check HECPA, LECPA & Vel. Fil. reset	see tables 4, 3 and 6
					Check Dust Cover Removal	

TEST	PARAMETER	TEST CONDITIONS	TEST INPUT	TEST OUTPUT	DATA RECORDING	LIMITS
SCA-5.8	Command 9 (velocity filter ON/OFF)		1. SIDE commands A, D, and E	word 7 Vel. Fil volts	check word 7 any frame	002 ± 2
			2. SIDE commands A, D, and E	word 7 vel. Fil volts	check word 7 frame 0	214 ± 2
SCA-5.9	Command 10 (LECPA volts ON/OFF)		1. SIDE commands B, D and E	word 8 LECPA volts	check word 8 any frame	2 ± 2
			2. SIDE commands B, D, and E	word 8 LECPA volts	check word 8 frame 0	207 ± 2
SCA-5.10	Command 11 (HECPA volts ON/OFF)		1. SIDE commands A, B, D, and E	word 3 HECPA volts	check word 3 any frame	4 ± 4
			2. SIDE commands A, B, D and E	word 3 HECPA volts	check word 3 frame 1	252 ±2
SCA-5.11	Command 12 (forced continuous calibration)	Initialize System	1. Turn 29V expt. power OFF then ON			
			2. SIDE commands C, D, and E	calibration outputs	Print out data, words 120 to 127	See table 8
	Command 7 (X10 accumulation)		3. SIDE commands A, B, C and E			
			4. SIDE commands C, D and E		Print out data, words 120 to 127	See table 9
SCA-5.12	Command 13 (CCIG high voltage ON/OFF)	Initialize System *See Note	1. Turn 29V expt. power OFF then ON	word 2, CCIG volts	check word 2 frame 8	Less than 100
			2. SIDE commands A, C, D and E	word 2, CCIG volts	check word 2, frames 40, 72, or 104	226 ± 7
			3. SIDE commands A. C, D and E	word 2, CCIG volts	check word 2 frames 8, 40, 72	Less than 100
SCA-5.13	Command 14 (Channeltron high voltage ON/OFF)	*See Note		word 2 -3.5KV supply	check word 2, frames 23, 55, 87 or 119	226 ± 7
			1. SIDE commands B, C, D, and E	word 2 -3.5 KV supply	check word 2 frames 23, 55, 87, 119	Less than 100
			2. SIDE commands B, C, D, and E	word 2 -3.5 KV supply	check word 2 frames 23, 55, 87, 119	226 ± 7
SCA-5.14	Command 15 (reset CIR)		1. SIDE commands A, B, C and D	wo rd 6 CIR and MR	check CIR and MR, word 6 in convenient frames	CIR 015 MR 014
			2. SIDE command E	word 6 CIR and MR	check CIR and MR, word 6 in convenient frames	CIR 000 MR 014

* Note Tests SCA-5.12 and SCA-5.13 cannot be performed unless experiment is in a vacuum. Voltage is always zero with lockout plug connected.

TABLE 1

SIDE Frame	Word 2	Word 6	SIDE Frame	Word 2	Word 6
0	211-217	Zero in	37	153-157	
1	000	All SIDE	38	18-205	
2	135-154	Frames except	39	244-248	003
3	000	where other-	40	219-233*	
4	18-205	wise stated	41	000	
5	000		42	226-236	
6	18-205		43	10-228	
7	000	003	44	10-228	
8	219-233*		45	226-232	
9	000		46	23-31	
10	226-236		47	226-232	
11	10-228		48	218-224	
12	10-228		49	192-198	
13	226-232		50	211-217	
14	0-137		51	0-8	
15	226-232		52	211-217	
16	218-224		53	192-198	
17	192-198		54	10-228	
18	211-217		55	219-233*	
19	0-8		56	226-236	
20	211-217		57	23-31	
21	192-198		58	220-230	
22	10-228		59	153-157	
23	219-233*		60	244-248	
24	226-236		61	226-232	
25	23-31		62	220-230	
26	220-230		63	226-232	
27	153-157		64	211-217	
28	244-248		65	195-205	
29	226-232		66	135-154	
30	220-230		67	197-218	
31	226-232		68	18-205	
32	211-217		69	226-232	
33	0-138		70	18-205	
34	135-154		71	197-218	003
35	0-138		72	219-233*	
36	18-205		73	000	

* These values can only be obtained with the experiment in vacuum. They will not be obtained with the lockout plug connected.

TABLE I (continued)

SIDE Frame	Word 2	Word 6	SIDE Frame	Word 2	Word 6
74	226-236		113	192-198	
75	10-228		114	211-217	
76	10-228		115	0-8	
77	226-232		116	211-217	
78	0-137		117	192-198	
79	226-232		118	10-228	
80	218-224		119	219-233*	
81	192-198		120	226-236	
82	211-217		121	000	001
83	0-8		122		002
84	211-217		123		003
85	192-198		124		000
86	10-228		125		000
87	219-233*		126		002
88	226-236		127		003
89	23-31				
90	220-230				
91	153-157				
92	244-248				
93	226-232				
94	220-230				
95	226-232				
96	211-217				
97	0-138				
98	135-154				
99	0-138				
100	18-205				
101	153-157				
102	18-205				
103	244-248	003			
104	219-233*				
105	000				
106	226-236				
107	10-228				
108	10-228				
109	226-232				
110	23-31				
111	226-232				
112	218-224				

* These values can only be obtained with the experiment in vacuum.

They will not be obtained with the lockout plug connected.

TABLE 2

0	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
GPS +5 VOLT ANALOG	GPS +4.5 KV	GPS +60V	GPS CCGE RANGE	GPS +5 VOLT ANALOG	GPS +4.5KV	GPS +60V	GPS CCGE RANGE	GPS +5 VOLT ANALOG	GPS +4.5KV	GPS +60V	GPS CCGE RANGE	GPS +5 VOLT ANALOG	GPS +4.5 KV	GPS +60V	CAL. RATE 1 CCGE RANGE
1	9	17	25	33	41	49	57	65	73	81	89	97	105	113	121
CIR CCGE	ELECTROMTR RANGE CCGE	CIR +30V	ELECTROMTR RANGE +30mV CAL	CIR 1 TIME CMD REG. STATUS	ELECTRMTR RANGE CCGE	CIR +30V	ELECTROMTR RANGE +30mV CAL	CIR PRE REG DUTY FACTOR	ELECTROMTR RANGE CCGE	CIR +30V	ELECTROMTR RANGE +30mV CAL	CIR 1 TIME CMD REG. STATUS	ELECTROMTR RANGE CCGE	CIR +30V	CAL. RATE 2 CCGE
2	10	18	26	34	42	50	58	66	74	82	90	98	106	114	122
GPS TEMP 1	GPS CCGE RANGE	GPS +5 VOLT DIGITAL	GPS +A/D REF VOLTS	GPS TEMP 1	GPS CCGE RANGE	GPS +5 VOLT DIGITAL	GPS +A/D REF. VOLTS	GPS TEMP 1	GPS CCGE RANGE	GPS +5 VOLT DIGITAL	GPS +A/D REF VOLTS	GPS TEMP 1	GPS CCGE RANGE	GPS +5 VOLT DIGITAL	CAL RATE 3 CCGE
3	11	19	27	35	43	51	59	67	75	83	91	99	107	115	123
MR CCGE	MR TEMP 4	MR GND	MR +1V CAL	MR 1 TIME CMD REG. STATUS	MR TEMP 4	MR GND	MR +1V CAL	MR DUST CVR & SEAL	MR TEMP 4	MR GND	MR +1V CAL	MR 1 TIME CMD REG. STATUS	MR TEMP 4	MR GND	CAL. RATE 4 CCGE
4	12	20	28	36	44	52	60	68	76	84	92	100	108	116	124
GPS TEMP 2	GPS TEMP 5	GPS −5 VOLTS	GPS +12V CAL	GPS TEMP 2	GPS TEMP 5	GPS −5VOLTS	GPS +12V CAL	GPS TEMP 2	GPS TEMP 5	GPS −5 VOLTS	GPS +12V CAL	GPS TEMP 2	GPS TEMP 5	GPS −5 VOLTS	CAL RATE 1 CCGE
5	13	21	29	37	45	53	61	69	77	85	93	101	109	117	125
CIR CCGE	CIR GPV	CIR −20 VOLTS	CIR GPV	CIR −1V CAL	CIR GPV	CIR −30 VOLTS	CIR GPV	CIR GPV	CIR GPV	CIR −30V VOLTS	CIR GPV	CIR −1V CAL	CIR GPV	CIR −30 VOLTS	CIR CCGE
6	14	22	30	38	46	54	62	70	78	86	94	102	110	118	126
GPS TEMP 3	GPS SOLAR CELL	GPS TEMP 6	GPS −A/D REF. VOLTS	GPS TEMP 3	GPS −30mV CAL	GPS TEMP 6	GPS −A/D REF. VOLTS	GPS TEMP 3	GPS SOLAR CELL	GPS TEMP 6	GPS −A/D REF VOLTS	GPS TEMP 3	GPS −30mV CAL	GPS TEMP 6	CAL RATE 2 CCGE
7	15	23	31	39	47	55	63	71	79	87	95	103	111	119	127
DUST COVER & SEAL CCGE	MR GPV	MR −3.5KV	MR GPV	DUST COVER & SEAL −12V CAL	MR GPV	MR −3.5KV	MR GPV	DUST COVER & SEAL DUST COVER & SEAL	MR GPV	MR −3.5KV	MR GPV	DUST COVER & SEAL −12V CAL	MR GPV	MR −3.5KV	CAL RATE 3 CCGE

GPS = GROUND PLANE STEP
CIR = COMMAND INPUT REGISTER
MR = MODE REGISTER
GPV = GROUND PLANE VOLTAGE

TABLE 3
HECPA VOLTS

SIDE Frames	Readout	Tolerance (counts)
a) 000 (after first cycle), 121-127	4	± 4
b) 001, 021, 041, 061, 081, 101, 000 (first cycle)	252	± 2
c) 002, 022, 042, 062, 082, 102	250	"
d) 003, 023, 043, 063, 083, 103	247	"
e) 004, 024, 044, 064, 084, 104	244	"
f) 005, 025, 045, 065, 085, 105	240	"
g) 006, 026, 046, 066, 086, 106	236	"
h) 007, 027, 047, 067, 087, 107	232	"
i) 008, 028, 048, 068, 088, 108	227	"
j) 009, 029, 049, 069, 089, 109	221	"
k) 010, 030, 050, 070, 090, 110	214	"
l) 011, 031, 051, 071, 091, 111	206	"
m) 012, 032, 052, 072, 092, 112	195	"
n) 013, 033, 053, 073, 093, 113	181	"
o) 014, 034, 054, 074, 094, 114	155	"
p) 015, 035, 055, 075, 095, 115	248	"
q) 016, 036, 056, 076, 096, 116	235	"
r) 017, 037, 057, 077, 097, 117	223	"
s) 018, 038, 058, 078, 098, 118	204	"
t) 019, 039, 059, 079, 099, 119	189	"
u) 020, 040, 060, 080, 100, 120	164	"

TABLE 4
Velocity Filter Volts Normal Mode

SIDE Frame	READOUT	TOLERANCE (counts)
000	214	± 2
001	210	"
002	206	"
003	202	"
004	198	"
005	194	"
006	188	"
007	184	"
008	179	"
009	174	"
010	168	"
011	163	"
012	158	"
013	150	"
014	143	"
015	136	"
016	130	"
017	122	"
018	116	"
019	112	"
020	192	"
021	190	"
022	186	"
023	182	"
024	178	"
025	173	"
026	169	"
027	164	"
028	159	"
029	154	"
030	148	"
031	142	"
032	138	"
033	130	"
034	122	"
035	116	"
036	108	"
037	102	"
038	96	"
039	92	"
040	173	"

TABLE 4 (continued)

SIDE Frame	READOUT	TOLERANCE (counts)
041	169	± 2
042	165	"
043	162	"
044	158	"
045	153	"
046	147	"
047	144	"
048	140	"
049	134	"
050	128	"
051	122	"
052	117	"
053	109	"
054	102	"
055	95	"
056	88	"
057	81	"
058	76	"
059	73	"
060	152	"
061	149	"
062	146	"
063	142	"
064	137	"
065	133	"
066	127	"
067	124	"
068	119	"
069	114	"
070	108	"
071	102	"
072	97	"
073	89	"
074	82	"
075	75	"
076	68	± 3
077	61	"
078	56	"
079	52	"

TABLE 4 (continued)

SIDE Frame	READOUT	TOLERANCE (counts)
080	133	± 2
081	129	"
082	125	"
083	122	"
084	118	"
085	113	"
086	107	"
087	103	"
088	99	"
089	93	"
090	88	"
091	82	"
092	78	"
093	68	± 3
094	62	"
095	54	"
096	46	"
097	41	± 4
098	35	"
099	32	"
100	112	± 2
101	108	"
102	105	"
103	101	"
104	97	"
105	93	"
106	87	"
107	82	"
108	78	"
109	73	"
110	67	± 3
111	62	"
112	56	"
113	48	"
114	41	± 4
115	34	"
116	27	"
117	20	± 5
118	15	± 6
119	11	± 7

TABLE 4 (continued)

SIDE Frame	READOUT	TOLERANCE
120	> 196	---
121	"	---
122	"	---
123	"	---
124	"	---
125	"	---
126	"	---
127	"	---

TABLE 5

Velocity Filter Volts (AMU 20 Mode) (Reset at 9)

SIDE Frame	Readout	Tolerance (counts)	SIDE Frame	Readout	Tolerance (counts)
60 & 0	214	± 2	100 & 40	133	± 2
61 & 1	210	"	101 & 41	129	"
62 & 2	206	"	102 & 42	125	"
63 & 3	202	"	103 & 43	122	"
64 & 4	198	"	104 & 44	118	"
65 & 5	194	"	105 & 45	113	"
66 & 6	188	"	106 & 46	107	"
67 & 7	184	"	107 & 47	103	"
68 & 8	179	"	108 & 48	99	"
69 & 9	174	"	109 & 49	93	"
70 & 10	192	"	110 & 50	112	"
71 & 11	190	"	111 & 51	108	"
72 & 12	186	"	112 & 52	105	"
73 & 13	182	"	113 & 53	101	"
74 & 14	178	"	114 & 54	97	"
75 & 15	173	"	115 & 55	93	"
76 & 16	169	"	116 & 56	87	"
77 & 17	164	"	117 & 57	82	"
78 & 18	159	"	118 & 58	78	"
79 & 19	154	"	119 & 59	73	"
80 & 20	173	"	120	> 196	--
81 & 21	169	"	121	"	--
82 & 22	165	"	122	"	--
83 & 23	162	"	123	"	--
84 & 24	158	"	124	"	--
85 & 25	153	"	125	"	--
86 & 26	147	"	126	"	--
87 & 27	144	"	127	"	--
88 & 28	140	"			
89 & 29	134	"			
90 & 30	152	"			
91 & 31	149	"			
92 & 32	146	"			
93 & 33	142	"			
94 & 34	137	"			
95 & 35	133	"			
96 & 36	127	"			
97 & 37	124	"			
98 & 38	119	"			
99 & 39	114	"			

TABLE 6
Low Energy Curved Plate Analyzer Voltage

SIDE Frame	LECPA Volts (normal mode)	LECPA Volts (vel. fil. reset at 9)
0-9	207 ± 2	207 ± 2
10-19	207 ± 2	166 ± 2
20-29	166 ± 2	127 ± 2
30-29	166 ± 2	86 ± 2
40-49	127 ± 2	46 ± 2
50-59	127 ± 2	5 ± 5
60-69	86 ± 2	207 ± 2
70-79	86 ± 2	166 ± 2
80-89	46 ± 2	127 ± 2
90-99	46± 2	86 ± 2
100-109	5 ± 5	46 ± 2
110-119	5 ± 5	5 ± 5
120-127	0	0

TABLE 7
Ground Plane Step Counting Sequence

Step	Word 2	Tolerance (counts)	Word 6
1	229	± 3	0
2	230	"	1
3	231	"	2
4	232	"	3
5	233	"	4
6	234	"	5
7	235	"	6
8	238	"	7
9	242	"	8
10	246	"	9
11	248	"	10
12	254	"	11
13	229	"	16
14	228	"	17
15	227	"	18
16	226	"	19
17	226	"	20
18	225	"	21
19	222	"	22
20	218	"	23
21	214	"	24
22	201	"	25
23	190	"	26
24	137	± 7	27

TABLE 8
Calibration Readouts

SIDE Frames	"Status"	Analog Subcom	Tolerance	HE Ion CTS	LE Ion CTS
a) 120	000	CCGE (see table 8a)		632800 ± 14000	2 ± 2
b) 121	001	"		2 ± 2	154 ± 4
c) 122	002	"		154 ± 4	19775 ± 400
d) 123	003	"		19775 ± 400	632800 ± 14000
e) 124	000	"		632800 ± 14000	2 ± 2
f) 125	000	"		2 ± 2	154 ± 4
g) 126	002	"		154 ± 4	19775 ± 400
h) 127	003	"		19775 ± 400	632800 ± 14000

TABLE 8a

CCGE Range	SF 120	121	122	123	124	125	126	127
1	228 ± 5	NA	0	0	< 177	166 ± 20	<252	247 ± 5
2	214 ± 5	NA	0	0	< 216	211 ± 5	<243	240 ± 3
3	192 ± 5	NA	0	0	<154	151 ± 3	<240	237 ± 3

TABLE 9

SIDE Frames		Status	HE Ion Cts.	LE Ion Cts.
120	a.	0000	999998 ± 1	2 ± 2
&	b.	"	2 ± 2	2 ± 2
124	c.	"	2 ± 2	2 ± 2
	d.	"	2 ± 2	2 ± 2
	e.	"	2 ± 2	2 ± 2
	f.	"	2 ± 2	2 ± 2
	g.	"	2 ± 2	2 ± 2
	h.	"	2 ± 2	2 ± 2
	i.	"	2 ± 2	2 ± 2
	j.	"	2 ± 2	2 ± 2
121	a.	0001*	2 ± 2	154 ± 4
&	b.	"	154 ± 4	308 ± 8
125	c.	"	308 ± 8	462 ± 12
	d.	"	462 ± 12	616 ± 16
	e.	"	616 ± 16	770 ± 20
	f.	"	770 ± 20	924 ± 24
	g.	"	924 ± 24	1078 ± 28
	h.	"	1078 ± 28	1232 ± 32
	i.	"	1232 ± 32	1386 ± 36
	j.	"	1386 ± 36	1540 ± 40
122	a.	0002	1540 ± 40	19775 ± 400
&	b.	"	19775 ± 400	39550 ± 800
126	c.	"	39550 ± 800	59324 ± 1200
	d.	"	59324 ± 1200	79099 ± 1600
	e.	"	79099 ± 1600	98874 ± 2000
	f.	"	98874 ± 2000	118649 ± 2400
	g.	"	118649 ± 2400	138424 ± 2800
	h.	"	138424 ± 2800	158199 ± 3200
	i.	"	158199 ± 3200	177974 ± 3600
	j.	"	177974 ± 3600	197749 ± 4000
123	a.	0003	197749 ± 4000	632800 ± 14000
&	b.	"	632800 ± 14000	999998 ± 1
127	c.	"	999998 ± 1	632797 ± 14000
	d.	"	632797 ± 14000	999998 ± 1
	e.	"	999998 ± 1	632797 ± 14000
	f.	"	632797 ± 14000	999998 ± 1
	g.	"	999998 ± 1	632797 ± 14000
	h.	"	632797 ± 14000	999998 ± 1
	i.	"	999998 ± 1	632797 ± 14000
	j.	"	632797 ± 14000	999998 ± 1

* In 125 a. through j., 0000