

BARNES



**Aerospace  
Systems Division**

14 Command List (Array A-2)	NO.	REV. NO.
	ATM-901	
	PAGE <u>1</u> OF <u>18</u>	
DATE 7/10/70		

This command list applies to Array A-2. Command lists for Arrays A, B and C (Flight Systems 1, 3, 4) are given in ATM-369 and the command list for Array D is given in ATM-872.

This ATM also summarizes and collates the command usage for the Arrays A, B, C, A-2 and D.

Revised by: V. C. Kemp  
V. C. Kemp

Approved by: [Signature]  
W. Tosh



Command List (Array A-2)

TABLE 1

<u>Symbol</u>	<u>Command Nomenclature</u>	<u>Octal Command</u>	<u>Decimal Command</u>	<u>Termination Point</u>
CD-31	ASE High Bit Rate ON <sup>3</sup>	003	3	Data Processor
CD-32	ASE High Bit OFF <sup>1</sup>	005	5	" "
CD-33	Normal Bit Rate <sup>1, 3</sup>	006	6	" "
CD-34	Slow Bit Rate <sup>3</sup>	007	7	" "
CD-35	Normal Bit Rate Reset <sup>4</sup>	011	9	" "
CD-1	Transmitter "A" Select <sup>2</sup>	012	10	Power Dist. Unit
CD-2	Transmitter ON <sup>2</sup>	013	11	" " "
CD-3	Transmitter OFF	014	12	" " "
CD-4	Transmitter "B" Select	015	13	" " "
CD-5	DSS HTR 1 ON (10 watts)	017	15	" " "
CD-6	DSS HTR 1 OFF <sup>2</sup>	021	17	" " "
CD-7	PDR #2 ON	022	18	" " "
CD-8	PDR #2 OFF <sup>2</sup>	023	19	" " "
CD-9	DSS HTR 2 ON (5 watts)	024	20	" " "
CD-10	DSS HTR 2 OFF <sup>2</sup>	025	21	" " "
CX-1	Dust Detector - ON	027	23	" " "
CX-2	Dust Detector - OFF	031	25	" " "
CD-36	Timer Output Accept <sup>1</sup>	032	26	Command Decoder
CD-37	Timer Output Inhibit	033	27	" "
CD-11	Data Processor "X" Select <sup>2</sup>	034	28	Power Dist. Unit
CD-12	Data Processor "Y" Select	035	29	" " "
CD-13	Experiment 1 Operational Power ON <sup>5</sup>	036	30	" " "
CD-14	Experiment 1 Standby Power <sup>2</sup>	037	31	" " "
CD-15	Experiment 1 Standby OFF	041	33	" " "
CD-16	Experiment 2 Operational Power ON	042	34	" " "
CD-17	Experiment 2 Standby Power <sup>2</sup>	043	35	" " "



NO.	ATM-901	REV. NO.	
PAGE	3	OF	18
DATE	7/10/70		

Command List (Array A-2)

TABLE 1 (CON'T)

<u>Symbol</u>	<u>Command Nomenclature</u>	<u>Octal Command</u>	<u>Decimal Command</u>	<u>Termination Point</u>
CD-18	Experiment 2 Standby OFF	044	36	Power Dist. Unit
CD-19	Experiment 3 Operational Power ON	045	37	" " "
CD-20	Experiment 3 Standby Power <sup>2</sup>	046	38	" " "
CD-21	Experiment 3 Standby OFF	050	40	" " "
CD-22	Experiment 4 Operational Power ON	052	42	" " "
CD-23	Experiment 4 Standby Power <sup>2</sup>	053	43	" " "
CD-24	Experiment Standby OFF	054	44	" " "
CD-25	Experiment 5 Operational Power ON	055	45	" " "
CD-26	Experiment 5 Standby Power <sup>2</sup>	056	46	" " "
CD-27	Experiment 5 Standby OFF	057	47	" " "
CU-1	PCU #1 Select <sup>2</sup>	060	48	Power Cond. Unit
CU-2	PCU #2 Select	062	50	" " "
CL-1	Gain Change LPX, LPY (Steps through following sequence one step per command) -30db <sup>1</sup> 0db -10db -20db	063	51	Passive Seismic Exp.
CL-2	Gain Change LPZ (Steps through same sequence as CL-1)	064	52	" " "
CL-3	Calibration SP ON/OFF <sup>1,6</sup>	065	53	" " "
CL-4	Calibration LP ON/OFF <sup>1</sup>	066	54	" " "
CL-5	Gain Change SPZ (Steps through same sequence as CL-1)	067	55	" " "
CL-6	Leveling Power X Motor <sup>8</sup> ON/OFF <sup>1</sup>	070	56	" " "
CL-7	Leveling Power Y Motor <sup>8</sup> ON/OFF <sup>1</sup>	071	57	" " "
CL-8	Leveling Power Z Motor <sup>8</sup> ON/OFF <sup>1</sup>	072	58	" " "



**Aerospacoe  
Systems Division**

NO.	ATM-901	REV. NO.
PAGE	4	OF 18
DATE	7/10/70	

Command List (Array A-2)

TABLE 1 (CON'T)

<u>Symbol</u>	<u>Command Nomenclature</u>	<u>Octal Command</u>	<u>Decimal Command</u>	<u>Termination Point</u>	
CL-9	Uncage <sup>7, 6</sup>	Arm/Fire	073	59	Passive Seismic Exp.
CL-10	Leveling Direction <sup>8</sup>	Plus <sup>1</sup> /Minus	074	60	" " "
CL-11	Leveling Speed <sup>8</sup>	Low <sup>1</sup> /High	075	61	" " "
CL-12	Thermal Control Mode	Auto <sup>1</sup> /Manual <sup>9</sup>	076	62	" " "
CL-13	Feedback Filter	IN/OUT <sup>1</sup>	101	65	" " "
CL-14	Coarse Level Sensor	IN/OUT <sup>1</sup>	102	66	" " "
CL-15	Leveling Mode <sup>8</sup>	Auto <sup>1</sup> /Manual	103	67	" " "
CT-1	SIDE Load Cmd #1	} Command Functions As shown in Note 1	104	68	Suprathermal Ion Det.
CT-2	SIDE Load Cmd #2		105	69	" " "
CT-3	SIDE Load Cmd #3		106	70	" " "
CT-4	SIDE Load Cmd #4		107	71	" " "
CT-5	SIDE Execute Command		110	72	" " "
CW-1	SWS Dust Cover Removal <sup>13</sup>		122	82	Solar Wind Experiment
CM-1	LSM Range Select		123	83	LSM Experiment
	(Steps through three ranges, one step per command)				
	200 gammas full scale <sup>1</sup>				
	50 " " "				
	100 " " "				
	repeat				



Command List (Array A-2)

TABLE 1 (CON'T)

<u>Symbol</u>	<u>Command Nomenclature</u>	<u>Octal Command</u>	<u>Decimal Command</u>	<u>Termination Point</u>
CM-2	Steady Field Offset <sup>12</sup> (Step through seven values, one step per command) 0 percent of full scale <sup>1</sup> +25 percent of full scale +50 percent of full scale +75 percent of full scale -75 percent of full scale -50 percent of full scale -25 percent of full scale 0 percent of full scale and repeat	124	84	LSM Experiment
CM-3	Steady Field Address (Steps through following step X-axis to Y-axis to Z-axis to neutral <sup>1</sup> )	125	85	" "
CM-4	Flip/Cal Inhibit In <sup>1</sup> /Out	127	87	" "
CM-5	Flip/Cal Initiate (Returns to Science mode after Flip/Cal sequence <sup>11</sup> )	131	89	" "
CM-6	LSM Filter (In <sup>1</sup> /Out)	132	90	" "
CM-7	Site Survey <sup>14</sup>	133	91	" "
CM-8	Temperature Control x <sup>1</sup> /y/OFF Repeat (Changes from X-axis sensor <sup>1</sup> to Y-axis sensor to OFF)	134	92	" "
CH-1	Normal (Gradient) Mode Select <sup>1</sup>	135	93	Heat Flow Experiment
CH-2	Low Conductivity Mode Select (Ring Source)	136	94	" " "



NO.	ATM-901	REV. NO.
PAGE	6	OF 18
DATE	7/10/70	

Command List (Array A-2)

TABLE 1 (CON'T)

<u>Symbol</u>	<u>Command Nomenclature</u>	<u>Octal Command</u>	<u>Decimal Command</u>	<u>Termination Point</u>
CH-3	High Conductivity Mode Select (Heat Pulse)	140	96	Heat Flow Experiment
CH-4	HF Full Sequence Select <sup>1</sup>	141	97	" " "
CH-5	HF Probe #1 Sequence Select	142	98	" " "
CH-6	HF Probe #2 Sequence Select	143	99	" " "
CH-7	HF Subsequence #1	144	100	" " "
CH-8	HF Subsequence #2	145	101	" " "
CH-9	HF Subsequence #3	146	102	" " "
CH-10	HF Heater Advance (Steps through following 16 step-sequence one step per command) All heaters off Probe #1 heater #2 ON All heaters off Probe #1 heater #4 ON All heaters off Probe #1 heater #1 ON All heaters off Probe #1 heater #3 ON All heaters off Probe #2 heater #2 ON All heaters off Probe #2 heater #4 ON All heaters off Probe #2 heater #1 ON All heaters off Probe #2 heater #3 ON repeat	152	106	" " "
CR-1	Timer Reset	150	104	Timer



NO.	ATM-901	REV. NO.	
PAGE	7	OF	18
DATE	7/10/70		

Command List (Array A-2)

TABLE 1 (NOTES)

- 1 Preset turn-on operating mode.
- 2 Lunar surface initial conditions programmed in during final system checkout.
- 3 Changes bit rate at end of ALSEP frame during which command executed.
- 4 Changes bit rate upon command execution.
- 5 Experiment numbers are noted in Table 4.
- 6 Short period calibration and uncage commands are initiated automatically at 18 hour intervals by the timer unless this feature has been inhibited by execution of CD-37.
- 7 Uncage command is executed automatically by the delayed command sequencer at 144 hours + 2 minutes, although uncaging may have been previously accomplished by ground command or as outlined in Note 6 above.
- 8 Manual leveling sequence is as follows: Send CL-15 to change from auto to manual leveling mode, change direction, and speed by CL-10 and CL-11 as necessary, and then execute leveling operation by sending appropriate leveling motor commands, CL-6, CL-7, or CL-8. Leveling operation is terminated by retransmission of CL-6, CL-7, or CL-8.
- 9 Sequence of command is auto on<sup>1</sup>/auto off/manual on/manual off.
- 10 For 0° flip position; reverse sign for 180° flip position.
- 11 Also activated every 18 hours after and including hour 162 by delayed command sequence.



NO.	ATM-901	REV. NO.	
PAGE	8	OF	18
DATE	7/10/70		

Command List (Array A-2)

TABLE 1 (NOTES CON'T)

- 12 Field offset sequence is as follows: select proper axis with CM-3, then execute CM-2 the proper number of times to step from present value to desired value.
- 13 Also executed at hour 144 and 4 minutes by delayed command sequence. Repetition of CW-1 three times within ten seconds results in High Voltage Gain Change.
- 14 First execution of CM-7 performs X-axis survey, second execution Y-axis survey and third execution Z-axis survey.





**Aerospace  
Systems Division**

NO.	REV. NO.
ATM-901	
PAGE 9	OF 18
DATE 7/10/70	

Command List (Array A-2)

**TABLE 2  
COMMAND SUMMARY**

Termination Point	Number of Commands				
	Array A	Array B	Array C	Array A2	Array D
Data Processor	3	3	5	3	5
Power Distribution Unit (Power Switching)	29	29	29	29	27
Power Conditioning Unit	2	2	2	2	2
Command Decoder	2	2	2	2	2
Timer	0	0	0	1	1
Passive Seismic	15	15	15	15	15
Suprathermal Ion Detector/CCGE	5	0	5	5	0
Charged Particle	0	8	8	0	0
Solar Wind	1	0	0	1	0
Magnetomer	8	0	0	8	8
Heat Flow	0	10	0	10	10
Active Seismic	0	0	7	0	7
CCGE (MSC)	0	5	0	0	0
<b>Total</b>	<b>65</b>	<b>74</b>	<b>73</b>	<b>76</b>	<b>77</b>

<u>Function</u>	<u>Octal Code</u>	<u>Number</u>
Test Commands	1, 2, 4, 10, 20, 40, 100, 77, 137, 157, 167, 173, 175, 176	14
Address	130 <sup>1</sup> /30, 116 <sup>2</sup> /16, 151 <sup>3</sup> /51, 25 <sup>4</sup> /65, 62 <sup>5</sup> /144.	10
Address Complement	47 <sup>1</sup> /147, 61 <sup>2</sup> /161, 26 <sup>3</sup> /126, 152 <sup>4</sup> /112, 115 <sup>5</sup> /33.	10
No Command	0, 177	2
Commands Assigned to Arrays A, B, C, A2, D		93
Commands Not Presently Assigned (153, 154, 155, 160, 171, 172, 174)		7
Commands Assigned with same code as either Address or Address Complement (25, 33, 62, 65, 112, 115, 144, 152)		136 -8
		128 Total Commands

Notes: 1. Array A 2. Array A2 3. Array B 4. Array C 5. Array D



**Aerospaces  
Systems Division**

NO. ATM-901	REV. NO.
PAGE 10	OF 18
DATE 7/10/70	

Command List (Array A-2)

TABLE 3

CROSS REFERENCE OF COMMAND NUMBER TO COMMAND FUNCTION

Decimal Command	Octal Command	Command Symbol	Array Usage					Test Cnds.	Address	Address Complement	No Command	Not Presently Assigned
			A	B	C	A-2	D					
1	1							X				
2	2							X				
3	3	CD-31			X			X				
4	4							X				
5	5	CD-32			X			X				
6	6	CD-33	X	X	X	X		X				
7	7	CD-34	X	X	X	X		X				
8	10							X				
9	11	CD-35	X	X	X	X		X				
10	12	CD-1	X	X	X	X		X				
11	13	CD-2	X	X	X	X		X				
12	14	CD-3	X	X	X	X		X				
13	15	CD-4	X	X	X	X		X				
14	16								X			
15	17	CD-5	X	X	X	X		X				
16	20							X				
17	21	CD-6	X	X	X	X		X				
18	22	CD-7	X	X	X	X		X				
19	23	CD-8	X	X	X	X		X				
20	24	CD-9	X	X	X	X		X				



**Aerospace  
Systems Division**

NO.	ATM-901	REV. NO.
PAGE	11	OF 18
DATE	7/10/70	

Command List (Array A-2)

TABLE 3 (CON'T)

Decimal Command	Octal Command	Command Symbol	Array Usage					Test Cmds.	Address	Address Complement	No Command	Not Presently Assigned
			A	B	C	A-2	D					
21	25	CD-10	X	X	X*	X	X		X*			
22	26									X		
23	27	CX-1	X	X	X	X			X			
24	30											
25	31	CX-2	X	X	X	X						
26	32	CD-32	X	X	X	X						
27	33	CD-37	X	X	X	X				X*		
28	34	CD-11	X	X	X	X						
29	35	CD-12	X	X	X	X						
30	36	CD-13	X	X	X	X						
31	37	CD-14	X	X	X	X						
32	40							X				
33	41	CD-15	X	X	X	X						
34	42	CD-16	X	X	X	X						
35	43	CD-17	X	X	X	X						
36	44	CD-18	X	X	X	X						
37	45	CD-19	X	X	X	X						
38	46	CD-20	X	X	X	X						
39	47									X		
40	50	CD-21	X	X	X	X						
41	51								X			

\*Cmds with same code as their Array Address or Address Complement.



NO.	ATM-901	REV. NO.
PAGE	12	OF 18
DATE	7/10/70	

Command List (Array A-2)

TABLE 3 (CON'T)

Decimal Command	Octal Command	Command Symbol	Array Usage					Test Cnds.	Address	Address Complement	No Command	Not Presently Assigned
			A	B	C	A#2	D					
42	52	CD-22	X	X	X	X	X					
43	53	CD-23	X	X	X	X	X					
44	54	CD-24	X	X	X	X	X					
45	55	CD-25	X	X	X	X	X					
46	56	CD-26	X	X	X	X	X					
47	57	CD-27	X	X	X	X	X					
48	60	CU-1	X	X	X	X	X					
49	61											
50	62	CU-2	X	X	X	X	X*		X*	X		
51	63	CL-1	X	X	X	X	X		X*			
52	64	CL-2	X	X	X	X	X					
53	65	CL-3	X	X	X*	X	X		X*			
54	66	CL-4	X	X	X	X	X					
55	67	CL-5	X	X	X	X	X					
56	70	CL-5	X	X	X	X	X					
57	71	CL-7	X	X	X	X	X					
58	72	CL-8	X	X	X	X	X					
59	73	CL-9	X	X	X	X	X					
60	74	CL-10	X	X	X	X	X					
61	75	CL-11	X	X	X	X	X					
62	76	CL-12	X	X	X	X	X					

Command List (Array A-2)

TABLE 3 (CON'T)

Decimal Command	Octal Command	Command Symbol	Array Usage					Test Cmds.	Address	Address Complement	No Command	Not Presently Assigned
			A	B	C	A-2	D					
63	77							X				
64	100							X				
65	101	CL-13	X	X	X	X	X					
66	102	CL-14	X	X	X	X	X					
67	103	CL-15	X	X	X	X	X					
68	104	CG-1 <sup>+</sup> /CT-1	X	X <sup>+</sup>	X	X	X					
69	105	CG-2 <sup>+</sup> /CT-2	X	X <sup>+</sup>	X	X	X					
70	106	CG-3 <sup>+</sup> /CT-3	X	X <sup>+</sup>	X	X	X					
71	107	CG-4 <sup>+</sup> /CT-4	X	X <sup>+</sup>	X	X	X					
72	110	CG-5 <sup>+</sup> /CT-5	X	X <sup>+</sup>	X	X	X					
73	111	CC-1		X	X							
74	112	CC-2		X	X*					X*		
75	113	CC-3		X	X							
76	114	CC-4		X	X							
77	115	CC-5		X	X							
78	116								X			
79	117	CC-6		X	X							
80	120	CC-7		X	X							
81	121	CC-8		X	X							
82	122	CW-1	X			X	X					
83	123	CM-1	X			X	X					



NO.	ATM-901	REV. NO.
PAGE	14	OF 18
DATE	7/10/70	

Command List (Array A-2)

TABLE 3 (CON'T)

Decimal Command	Octal Command	Command Symbol	Array Usage					Test Cmds.	Address	Address Complement	No Command	Not Presently Assigned
			A	B	C	A-2	D					
84	124	CM-2	X			X	X					
85	125	CM-3	X			X	X					
86	126								X			
87	127	CM-4	X			X	X					
88	130							X				
89	131	CM-5	X			X	X					
90	132	CM-6	X			X	X					
91	133	CM-7	X			X	X					
92	134	CM-8	X			X	X					
93	135	CH-1		X		X	X					
94	136	CH-2		X		X	X	X				
95	137							X				
96	140	CH-3		X		X	X					
97	141	CH-4		X		X	X					
98	142	CH-5		X		X	X					
99	143	CH-6		X		X	X					
100	144	CH-7		X		X	X*		X*			
101	145	CH-8		X		X	X					
102	146	CH-9		X		X	X					
103	147									X		
104	150	CR-1				X	X					
105	151							X				
106	152	CH-10		X		X	X			X		



**Aerospace  
Systems Division**

NO.	ATM-901	REV. NO.	
PAGE	15	OF	18
DATE	7/10/70		

Command List (Array A-2)

TABLE 3 (CON'T)

Decimal Command	Octal Command	Command Symbol	Array Usage					Test Cmds.	Address	Address Complement	No Command	Not Presently Assigned
			A	B	C	A-2	D					
107	153											X
108	154											X
109	155											X
110	156	CS-1			X		X					
111	157							X				
112	160											X
113	161									X		
114	162	CS-3			X		X					
115	163	CS-4			X		X					
116	164	CS-5			X		X					
117	165	CS-6			X		X					
118	166	CS-7			X		X					
119	167							X				
120	170	CS-8			X		X					
121	171											X
122	172											X
123	173							X				
124	174											X
125	175							X				
126	176							X				
127	177										X	
0	000										X	
TOTALS			65	74	73	76	77	14	10	10	12	7



**Aerospace  
Systems Division**

NO. ATM-901	REV. NO.
PAGE <u>16</u> OF <u>18</u>	
DATE 7/10/70	

Command List (Array A-2)

TABLE 4

Array Experiment Numbers..

Array Expt No	A	B	C	A-2	D
1	PSE	HFE	PSE	PSE	PSE
2	LSM	PSE	ASE	LSM	ASE
3	SWS	CCGE	SIDE	SWS	LSM
4	SIDE	CPLEE	CPLEE	SIDE	HFE
5	—	—	—	HFE	—





**Aerospace  
Systems Division**

NO.	REV. NO.
ATM-901	
PAGE 17	OF 18
DATE 7/10/70	

Command List (Array A-2)

Note 1

Suprathermal Ion Detector Command Structure

All commands are pulses. The SIDE uses these pulsed commands by encoding. Two encoded commands are used for one time only operations as well as routine operation. Four of the five incoming command lines are encoded in a four bit command buffer which is then strobed into a second (mode) buffer where it is held for decoding and execution. This latter buffer might be thought of as an execute buffer. The 110 execute command is always transmitted last. The commands are as follows:

	SYMBOL	FUNCTION	OCTAL COMMAND SEQUENCE				
			104	105	106	107	110
One Time Commands	CI-1	Break CCIG Seal <sup>2</sup>		X			X
	CI-2	Blow Dust Cover <sup>2</sup>				X	X
Operational Commands	CI-5	Not Used					X
	CI-6	Ground Plane Step Programmer ON <sup>1</sup> /OFF	X				X
	CI-7	Reset SIDE Frame Counter at 10		X			X
	CI-8	Reset SIDE Frame Counter at 39	X	X			X
	CI-9	Reset Velocity Filter at 9			X		X
	CI-10	Reset SIDE Frame Counter at 79	X		X		X
	CI-11	Reset SIDE Frame Counter at 70 and Velocity Filter Counter at 9		X	X		X
	CI-12	X 10 accumulation interval ON/OFF <sup>1</sup>	X	X	X		X
	CI-13	Master Reset				X	X
	CI-14	Velocity Filter Voltage ON <sup>1</sup> /OFF	X			X	X
	CI-15	Low Energy CPA high voltage ON <sup>1</sup> /OFF		X		X	X
	CI-16	High Energy CPA high voltage ON <sup>1</sup> /OFF	X	X		X	X
	CI-17	Force Continuous Calibration (Reset to 120)			X	X	X
	CI-18	Cold Cathode Ion Gauge high Voltage ON <sup>1</sup> /OFF	X		X	X	X
	CI-19	Channeltron high voltage ON <sup>1</sup> /OFF		X	X	X	X
	CI-20	Reset Command Register	X	X	X	X	X

Commands CI-1 and CI-2 have been incorporated into the design of the SIDE as one time CCIG Seal Break and one time Dust Cover Blow. These are identical to CI-7 and CI-13 respectively, thus the first time CI-7 is executed, so is CI-1 but not thereafter. A similar statement holds for CI-13 and CI-2.

<sup>1</sup>Preset turn-on operating mode.

<sup>2</sup>Also activated at hour 144 by delayed command sequence.



**Aerospace  
Systems Division**

NO.	REV. NO.
ATM-901	
PAGE <u>18</u>	OF <u>18</u>
DATE	7/10/70

Command List (Array A-2)

Note 2

Heat Flow Command Structure

Octal commands 144 through 146 are used to select subsets of the full heat flow measurement sequence as follows:

Command 144 selects a subset consisting of the four high sensitivity gradient measurements only.

Command 144 followed by command 145 selects a subset consisting of the four low sensitivity gradient measurements only.

Command 144 followed by command 146 selects a subset consisting of probe ambient temperature measurements only.

Command 145 followed by command 146 selects a subset consisting of thermocouple measurements only.