



Space  
Systems Division

Command List (Array A-2)

|               |              |
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This command list in Table 1, 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 in Tables 2 and 3.

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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 2 ON (5 watts)                         | 017                  | 15                     | " " "                    |
| CD-6          | DSS HTR 2 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 1 ON (10 watts)                        | 024                  | 20                     | " " "                    |
| CD-10         | DSS HTR 1 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, 17</sup>    | 043                  | 35                     | " " "                    |

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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 <sup>18</sup>                                                                                | 153                  | 107                    | " " "                    |
| CD-23         | Experiment 4 Standby Power <sup>2</sup>                                                                                        | 053                  | 43                     | " " "                    |
| CD-24         | Experiment 4 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<br>(Steps through following sequence one step per command)<br>-30db <sup>1</sup><br>0db<br>-10db<br>-20db | 063                  | 51                     | Passive Seismic Exp.     |
| CL-2          | Gain Change LPZ<br>(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<br>(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                     | " " "                    |

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<br>Functions<br>As shown<br>in Note 15 | 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                                             |                                                  |                        |                          |                       |

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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><br>(Step through seven values, one step per command)<br>0 percent of full scale <sup>1</sup><br>+25 percent of full scale<br>+50 percent of full scale<br>+75 percent of full scale<br>-75 percent of full scale<br>-50 percent of full scale<br>-25 percent of full scale<br>0 percent of full scale and repeat | 124                  | 84                     | LSM Experiment           |
| CM-3          | Steady Field Address<br>(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<br>(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<br>(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<br>(Ring Source)                                                                                                                                                                                                                                                                                                      | 136                  | 94                     | " " "                    |

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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<br>(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                                                                                                                                                                                                                                                                                                                                                                                                                                                 | } Command Func-<br>tions as shown in<br>Note 16 | 144                    | 100                      | " " " |
| CH-8          | HF Subsequence #2                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 | 145                    | 101                      | " " " |
| CH-9          | HF Subsequence #3                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 | 146                    | 102                      | " " " |
| CH-10         | HF Heater Advance<br>(Steps through following 16 step-sequence<br>one step per command)<br>All heaters off<br>Probe #1 heater #2 ON<br>All heaters off<br>Probe #1 heater #4 ON<br>All heaters off<br>Probe #1 heater #1 ON<br>All heaters off<br>Probe #1 heater #3 ON<br>All heaters off<br>Probe #2 heater #2 ON<br>All heaters off<br>Probe #2 heater #4 ON<br>All heaters off<br>Probe #2 heater #1 ON<br>All heaters off<br>Probe #2 heater #3 ON<br>repeat | 152                                             | 106                    | " " "                    |       |
| CR-1          | Timer Reset                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 150                                             | 104                    | Timer                    |       |

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 + 1 min. by delayed command sequence.

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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 + 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.





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Note 15 (Table 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:

One Time  
Commands

Operational  
Commands

SYMBOL    FUNCTION

OCTAL  
COMMAND SEQUENCE

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

| 104 | 105 | 106 | 107 | 110 |
|-----|-----|-----|-----|-----|
|     | X   |     |     | X   |
|     |     |     | X   | X   |
|     |     |     |     | X   |
| X   |     |     |     | X   |
|     | X   |     |     | X   |
| X   | X   |     |     | X   |
|     |     | X   |     | X   |
| X   |     | X   |     | X   |
|     | X   | X   |     | X   |
|     | X   | X   |     | X   |
| X   |     | X   |     | X   |
|     | X   | X   |     | 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>At the time of the test...



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Note 16 (Table 1)

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.

Note 17

Experiment 2 is effectively OFF in this mode.

Note 18

This experiment ON command bypasses the Central Station Timer Automatic EXP ON command by modification to the harness assembly.



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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> |

| Function                                                                                                      | Octal Code                                                                                                     | Number                    |
|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|---------------------------|
| 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                                                                    |                                                                                                                | 94                        |
| Commands Not Presently Assigned (154, 155, 160, 171, 172, 174)                                                |                                                                                                                | 6                         |
| Commands Assigned with same code as either Address or Address Complement (25, 33, 62, 65, 112, 115, 144, 152) |                                                                                                                | 136                       |
|                                                                                                               |                                                                                                                | -8                        |
|                                                                                                               |                                                                                                                | <u>128</u> Total Commands |

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

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TABLE 3

CROSS REFERENCE OF COMMAND NUMBER TO COMMAND FUNCTION

| Decimal Command | Octal Command | Command Symbol | Array Usage |   |   |     |   | Test Cmds. | 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          |         |                    |            |                        |

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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 |            |         |                    |            |                        |
| 21              | 25            | CD-10          | X           | X | X* | X   | X |            | X*      |                    |            |                        |
| 22              | 26            |                |             |   |    |     |   |            |         | X                  |            |                        |
| 23              | 27            | CX-1           | X           | X | X  | X   |   |            |         |                    |            |                        |
| 24              | 30            |                |             |   |    |     |   |            | X       |                    |            |                        |
| 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.

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  |            |         |                    |            |                        |
| 42              | 52            | CD-22             | 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  |            |         |                    |            |                        |
| 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-6 <sup>6</sup> | 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  |            |         |                    |            |                        |

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 |            |         |                    |            |                        |
| 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  |     |   |            |         | 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   |   |            |         |                    |            |                        |
| 83              | 123           | CM-1                    | 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  |            |         |                    |            |                        |
| 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  |            |         |                    |            |                        |
| 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                  |            |                        |



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           | CD-22          |             |    |    | X   |    |            |         |                    |            |                        |
| 108             | 154           |                |             |    |    |     |    |            |         |                    |            | X                      |
| 109             | 155           |                |             |    |    |     |    |            |         |                    |            | X                      |
| 110             | 156           | CS-1           |             |    | X  |     |    | X          |         |                    |            |                        |
| 111             | 157           |                |             |    |    |     |    |            |         |                    |            | X                      |
| 112             | 160           |                |             |    |    |     |    |            |         |                    |            |                        |
| 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                 | 2          | 6                      |



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|              |          |
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Command List (Array A-2)

TABLE 4

Array Experiment Numbers

| Array<br>Expt<br>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  | —   |