

Space  
Systems Division

Recommended Operations Plan  
for  
Passive Seismic Experiment Package

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This revision of EATM-38 presents the recommendations regarding those operational aspects of PSEP which are different than ALSEP Flight System 1.

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## INTRODUCTION

The normal operation of PSEP when deployed on the lunar surface is very similar to that described for ALSEP (with PSE the only active experiment) in ATR-31. This memorandum provides revised planning—information on the special activities necessary to prepare PSEP for flight, to initiate lunar operation and to establish the proper conditions for lunar night survival and subsequent re-initiation.

## PSEP PRE-FLIGHT MODE

As installed in the LM SEQ bay, PSEP shall be in a functional mode (non-operating, of course) defined by the pre-set selections listed in Table I. The back-up timer will be started before shipment from the factory. The PSE will be prepared for service by cutting the Sensor Enclosure Tube in the ALSEP Launch Preparatory Site (ALPS) and by removing the Uncage Plug during assembly into the SEQ bay.

## FIRST LUNAR DAY INITIAL OPERATION

As soon as the east side of the solar array is fully deployed (and assuming that the astronaut does not stand or walk so as to shadow the panels) there will be adequate power to immediately activate PSEP. Since the antenna alignment is the final crew task before leaving PSEP, determination of down-link operation should be possible almost immediately.

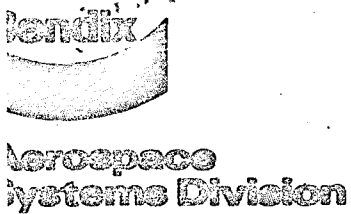
At the first opportunity before Ascent Stage take-off which is consistent with the Apollo communications requirements, the transmitted telemetry data shall be evaluated with particular attention to power balance and central station temperatures. The PSE thermal control shall be turned off. Any contingency action indicated by this evaluation shall be taken immediately (assuming availability of the MSFN command link).

To initiate PSE operation, it remains to turn the PSE operational power ON, uncage and level the sensor as detailed in the ALSEP Operations Plan (ATR-31).

## FIRST DAY SYSTEM SHUT DOWN

To prepare PSEP for survival during the lunar night, the following shut-down sequence will be implemented.

1. As reserve power decreases at the end of the lunar day to 2 to 3 watts command the PSE to Standby ON (octal command 037) and verify that it was executed.



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TABLE 1

STATUS OF SELECTABLE MODES DURING FLIGHT

<u>Equipment</u>	<u>Function</u>	<u>*Flight Status and/or Command</u>
<u>Power Subsystem</u>		
PCU	Redundant Channels	PC 1 SEL (060)
<u>Data Subsystem</u>		
PCU	Experiment Power	EXP 1 STBY SEL (037)
	Redundant Transmitters	XMTR A SEL (012)
	Transmitter Power	XMTR ON (013)
	Fixed Electrical Loads	DISSIP R1 OFF (021) DISSIP R2 OFF (023)
	Redundant Data Processors	DDS/PROC X SEL (034)
Data Processor	Data Rate	NORM BIT RT (011)
Command Decoder	Timer Output	TIMER OUTPUT ACCPT (032)
Passive Seismic Exper.	Long Period Gain (X), (Y), (Z)	-30 db (063 & 064)
	Short Period Gain (Z)	-30 db (067)
	Leveling Direction	LVL DIR POS (074)
	Leveling Speed	LVL SPEED LO (075)
	Leveling Mode	AUTO (103)
	Coarse Level Sensor	LVL SENSOR OUT (102)
	Leveling Power (X), (Y), (Z)	OFF (070, 071, 072)
	Thermal Control Mode	AUTO ON (076)
	Calibration (SP)	OFF (065)
	Calibration (LP)	OFF (066)
	Filter	PSE FILT OUT (101)
	Seismic Sensors	Caged ( — )
<u>Dust Detector</u>	**Operating Power	ON (027)

\* For nomenclature see Appendix A.

\* Since Dust Detector power is controlled by an electronic flip-flop the selection state upon initial PSEP power ON cannot be predicted.

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2. Command PCU into PC 2 mode (octal command 062) and verify that the transition was made successfully.
3. When reserve power reaches approximately 1 watt command the transmitter power OFF (octal command 014).

SECOND LUNAR DAY INITIAL OPERATION

No commands should be sent to PSEP during the first 24 hours following lunar sunrise at the PSE location. It is estimated that the average thermal plate temperature will rise above the minimum operating temperature of  $-10^{\circ}\text{F}$  during this 24 hour period.

1. At the proper time command the transmitter ON (octal command 013).
2. If link is not established, command the transmitter power OFF (014), wait several hours and then repeat step 1. If link is established, evaluate the housekeeping data.
3. Command PSE power ON (octal command 036).
4. When real-time data monitoring is no longer desired, an engineering evaluation of operational status should be made to determine the merit (if any) in returning the PCU to PC 1 operational mode.

## Appendix A

## PSEP COMMUNICATIONS LIST

MEASUREMENTS				COMMANDS		
SYMBOL	LOCATION/NAME	ABBR.	OCTAL	SYMBOL	NOMENCLATURE	ABBR.
DA-01	Barker Code & Complement	PSEP FRAME SYNC				
DA-02	PSEP Frame Counter	PSEP FRAME CNTR				
DA-03	PSEP Bit Rate ID	PSEP BIT RT ID	006	CD-33	Normal Bit Rate	NORM BIT RT SEL
DA-04	PSEP ID	PSEP ID	007	CD-34	Slow Bit Rate	LOW BIT RT SEL
DA-05	Received Command Message	PSEP CMD AS RCVD	011	CD-35	Processor X or Y Reset	NORM BIT RT RST
DA-06	Cmd. Message Accept Pulse	PSEP CMD MAP	034	CD-11	Data Processor X Select	DSS/PROC X SEL
DA-07	PSEP Filler Bits	PSEP FILLER BITS	035	CD-12	Data Processor Y Select	DSS/PROC Y SEL
AT-01	Solar Panel 1 Temp	SOLAR PNL 1 DEG F				
AT-02	Solar Panel 2 Temp	SOLAR PNL 2 DEG F				
AT-03	Thermal Plate 1	THERM PLT 1 DEG F				
AT-04	Thermal Plate 2	THERM PLT 2 DEG F				
AT-05	Thermal Plate 3	THERM PLT 3 DEG F				
AT-06	Thermal Plate 4	THERM PLT 4 DEG F				
AT-07	Thermal Plate 5	THERM PLT 5 DEG F				
AT-08	Primary Structure Wall Temp 1	PRI/ST W1 DEG F				
AT-09	Primary Structure Wall Temp 2	PRI/ST W2 DEG F				
AT-10	Primary Struct. Bottom Temp 1	PRI/ST B1 DEG F				
AT-11	Primary Struct. Wall Temp 3	PRI/ST W3 DEG F				
AT-12	Insulation Inner Temp	INSUL INT DEG F				
AT-13	Insulation Outer Temp	INSUL EXT DEG F				
AT-21	Local Osc. Crystal A Temp	RCVR XTAL A DEG F				
AT-22	Local Osc. Crystal B Temp	RCVR XTAL B DEG F	012	CD-01	Transmitter A Select	XMTR A SEL
AT-23	Transmitter A Crystal Temp	XMTR A XTAL DEG F	013	CD-02	Transmitter ON	XMTR ON
AT-24	Transmitter A Heat Sink Temp	XMTR A HT/S DEG F	014	CD-03	Transmitter OFF	XMTR OFF
AT-25	Transmitter B Crystal Temp	XMTR B XTAL DEG F	015	CD-04	Transmitter B Select	XMTR B SEL
AT-26	Transmitter B Heat Sink Temp	XMTR B HT/S DEG F				
AT-27	Analog DP, Base Temp	DSS/A BASE DEG F				
AT-28	Analog DP, Internal Temp	DSS/A INT DEG F				
AT-29	Digital DP, Base Temp	DSS/D BASE DEG F				
AT-30	Digital DP, Internal Temp	DSS/D INT DEG F				
AT-31	Command Decoder Base Temp	CMD DEC BAS DEG F				
AT-32	Command Decoder Internal Temp	CMD DEC INT DEG F				
AT-33	Command Demodulator, VCO Temp	CMD DEC VCO DEG F				
AT-34	Power Distribution, Base Temp	PDU BASE DEG F				
AT-35	Power Distribution, Int. Temp	PDU INT DEG F				
AT-36	PCU, Power Osc. #1 Temp	PCU 1 OSC DEG F	060	CU-01	PCU #1 Select	PCU 1 SEL
AT-37	PCU, Power Osc. #2 Temp	PCU 2 OSC DEG F	062	CU-02	PCU #2 Select	PCU 2 SEL
AT-38	PCU, Regulator #1 Temp	PCU 1 REG DEG F				
AT-39	PCU, Regulator #2 Temp	PCU 2 REG DEG F				
AE-01	0.25 VDC Calibration	DSS ADC 0.25 VOLTS				
AE-02	4.75 VDC Calibration	DSS ADC 4.75 VOLTS				
AE-03	Converter Input Voltage	PCU IN VOLTS				
AE-04	Converter Input Current	PCU IN AMPS	017	CD-05	PDR #1 ON	DISSIP R1 ON
AE-05	Shunt Reg #1 Current	PCU 1 SHUNT AMPS	021	CD-06	PDR #1 OFF	DISSIP R1 OFF
AE-06	Shunt Reg #2 Current	PCU 2 SHUNT AMPS	022	CD-07	PDR #2 ON	DISSIP R2 ON
AE-07	PCU Output Voltage #1 (29v)	PCU +29V OUT	023	CD-08	PDR #2 OFF	DISSIP R2 OFF
AE-08	PCU Output Voltage #2 (15v)	PCU +15V OUT				
AE-09	PCU Output Voltage #3 (12v)	PCU +12V OUT				
AE-10	PCU Output Voltage #4 (5v)	PCU +5V OUT				
AE-11	PCU Output Voltage #5 (-12v)	PCU -12V OUT				
AE-12	PCU Output Voltage #6 (-6v)	PCU -6V OUT				
AE-13	RCVR Pre-Limiting Level	RCVR PRE/LIM DBM				
AE-14	RCVR Local Osc. Level	RCVR L/O LVL DBM				
AE-15	Transmitter A, AGC Voltage	XMTR A AGC VOLTS				
AE-16	Transmitter B, AGC Voltage	XMTR B AGC VOLTS				
AE-17	Trans A Power Doubler DC Curr.	XMTR A X2 PWR MA				
AE-18	Trans B Power Doubler DC Curr.	XMTR B X2 PWR MA				
AB-01	Cmd Demod 1 KHz Present	RCVR 1KHZ STA	032	CD-36	Timer Output Accept	TIMER OUT ACCTPT
			033	CD-37	Timer Output Inhibit	TIMER OUT INHIB
AX-01	Dust Cell #1 Temp	DUST CELL 1 DEG F				
AX-02	Dust Cell #2 Temp	DUST CELL 2 DEG F				
AX-03	Dust Cell #3 Temp	DUST CELL 3 DEG F				
AX-04	Dust Cell #1 Output	DUST 1 OUT MW/CM2	027	CX-01	Dust Detector ON	DUST CELLS ON
AX-05	Dust Cell #2 Output	DUST 2 OUT MW/CM2	031	CX-02	Dust Detector OFF	DUST CELLS OFF
AX-06	Dust Cell #3 Output	DUST 3 OUT MW/CM2				
AB-04	Power Dist Exper #1 and #2 Standby	EXP 1/2 STBY STA	036	CD-13	Experiment 1 Power ON	EXP 1 OPER SEL
			037	CD-14	Experiment 1 Power Standby	EXP 1 STBY SEL
AB-05	Power Dist Exper #3, #4, and #5 Standby	EXP 345 STBY STA	041	CD-15	Experiment 1 Standby OFF	EXP 1 STBY OFF
DL-01	Long Period X Seismic	PSE/X DATA				
DL-02	Long Period Y Seismic	PSE/Y DATA				
DL-03	Long Period Z Seismic	PSE/Z DATA				
DL-04	Long Period X Tidal	PSE TIDAL X DATA	101	CL-13	Feedback Filter	PSE FILT IN/OUT
DL-05	Long Period Y Tidal	PSE TIDAL Y DATA				
DL-06	Long Period Z Tidal	PSE TIDAL Z DATA				
DL-07	PSE Instrument Temp	PSE INST DEG F				
DL-08	Short Period Z Seismic	PSE/SP DATA				
AL-01	L.P. Ampl Gain (X&Y)	PSE/XY GAIN DB	063	CL-01	Gain Change LPX, LPY	PSE/XY GAIN CH
AL-02	L.P. Ampl Gain (Z)	PSE/Z GAIN DB	064	CL-02	Gain Change LPZ	PSE/Z GAIN CH
AL-03	Level Direction & Speed	LVL DIR/V STA	074	CL-10	Leveling Direction	LVL DIR POS/NEG
			075	CL-11	Leveling Speed	LVL SPEED HI/LO
AL-04	S. P. Ampl Gain (Z)	PSE/SP GAIN DB	067	CL-05	Gain Change SPZ	PSE/SP GAIN CH
AL-05	Leveling Mode & Coarse Sensor Mode	LVL MODE/NSNR STA	103	CL-15	Leveling Mode	PSE LVL MDE A/F
			102	CL-14	Coarse Level Sensor	LVL NSNR IN/OUT
AL-06	Thermal Control Status	PSE T CTL STA	076	CL-12	Thermal Control Mode	PSE T CTL CH
AL-07	Calibration Status LP&SP	PSE/LP/SP CAL STA	066	CL-04	Calibration LP	PSE/LP CAL CH
			065	CL-03	Calibration SP	PSE/SP CAL CH
AL-08	Uncage Status	PSE UNCAGE STA	073	CL-09	Uncage	UNCAGE ARM/FIRE
			070	CL-06	Leveling Power X Motor	LVL MTRX ON/OFF
			071	CL-07	Leveling Power Y Motor	LVL MTRY ON/OFF
			072	CL-08	Leveling Power Z Motor	LVL MTRZ ON/OFF

NOTE: Location/name and nomenclature columns for reference only (not latest revisions)