This document illustrates the detailed variations in the operational load of the subsystems of ALSEP. This information has been generated in response to Action Item B5-0712-20B which resulted from System PDR Change No 13-12.

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The ALSEP power budget estimates of 8 July 1966 as published in the ALSEP System Mass Properties Report (ATM - 268D) indicate an operating load demand during lunar night of 54.36 watts. This value is arrived at by totalling the most recent estimates of power requirements for steady state functional operation at lunar midnight (see Figures 1 through 5). A number of momentary functions can be initiated by command which demand power in excess of this steady state value. The maximum value of the power demand of eachequipment group is listed in ATM - 268D under the heading of "Peak Power". It should be recognized that these power demands cannot coexist and hence the total has no physical significance. The commands which initiate the heaviest momentary power demands are listed in Table I. The power to implement these functions may (according to Exhibit 'B' of the ALSEP contract) be borrowed from, or time-shared with, some other function.

The manner in which power is distributed (ATM - 381) ensures that functional power is borrowed only when reserve power is not available. The first seven momentary functions listed in Table I occur during system turn-on sequence when these unusual loads can be scheduled to suit the available power. These commands are not considered to "time-share" power since steady-state operation of the system has not been established when they are executed. The listed Active Seismic experiment functions occur when the system is in a special mode with special power demands. The remaining two functions, magnetometer "Flip/Calibrate" and Heat Flow "Heater", share power with some other function. The design of the Heat Flow experiment at the time of writing has not progressed to the point of permitting detailed power profile analysis. Exhibit B of the ALSEP contract has allocated up to 2 watts for this function. The duty cycle has not been established. The power profile during the magnetometer "Flip/Calibrate" function is detailed in Figure 4 and expanded in Figure 6b. The superposition of this 7 watt pulse with the steady state system power dissipation is illustrated in detail in Figure 6a for two different initiation conditions.

The power dissipation figures shown in Figure 6a represent an arithmetic sum of possible power demands and do not necessarily represent the system operation. Whenever the system power demand is within 0.5 watt of the RTG output, the operational load is decreased by placing an experiment on "stand-by". Figure 7 illustrates the reaction of the system to the "flip" pulse generated within the Data Subsystem when that pulse occurs

Table I: Commanded Momentary Power Demands

Experiment	Commanded Function	Total Power Demand (watts)	Duration (sec)
Passive Seismic	Uncage	7.7	150
	Levelling	10.5	450
Solar Wind	Remove Dust Cover	?(6.5)	0.005
Side	Remove Dust Cover	?(6.5)	0.005
	Break Pressure Seal	?(6.5)	?
CPLE	Remove Dust Cover	?(5.0)	0.005
Magnetometer	Site Survey	7.5	30 (9pulses)
	Flip/Calibrate	7.0	30
Active Seismic	Uncover Mortar	?(7.0)	0.005
	Fire Thumper	?(7.0)	0.005
	Fire Mortar	?(6.0)	0.005
Heat Flow	Probe Heater	?(9.5)	?

at lunar midnight (assuming that all heaters are switched ON) and the system power input is 56.0 watts. If the magnetometer "Flip/Calibrate" function is commanded from earth, it is expected that the quantity of reserve power and the status of the power distribution switches will be displayed to the mission controllers. If the reserve power protection circuit places an experiment on "standby" during a ground-commanded magnetometer "Flip/Calibrate" it is also expected that that experiment will be reinstated when the "Flip" pulse has passed.

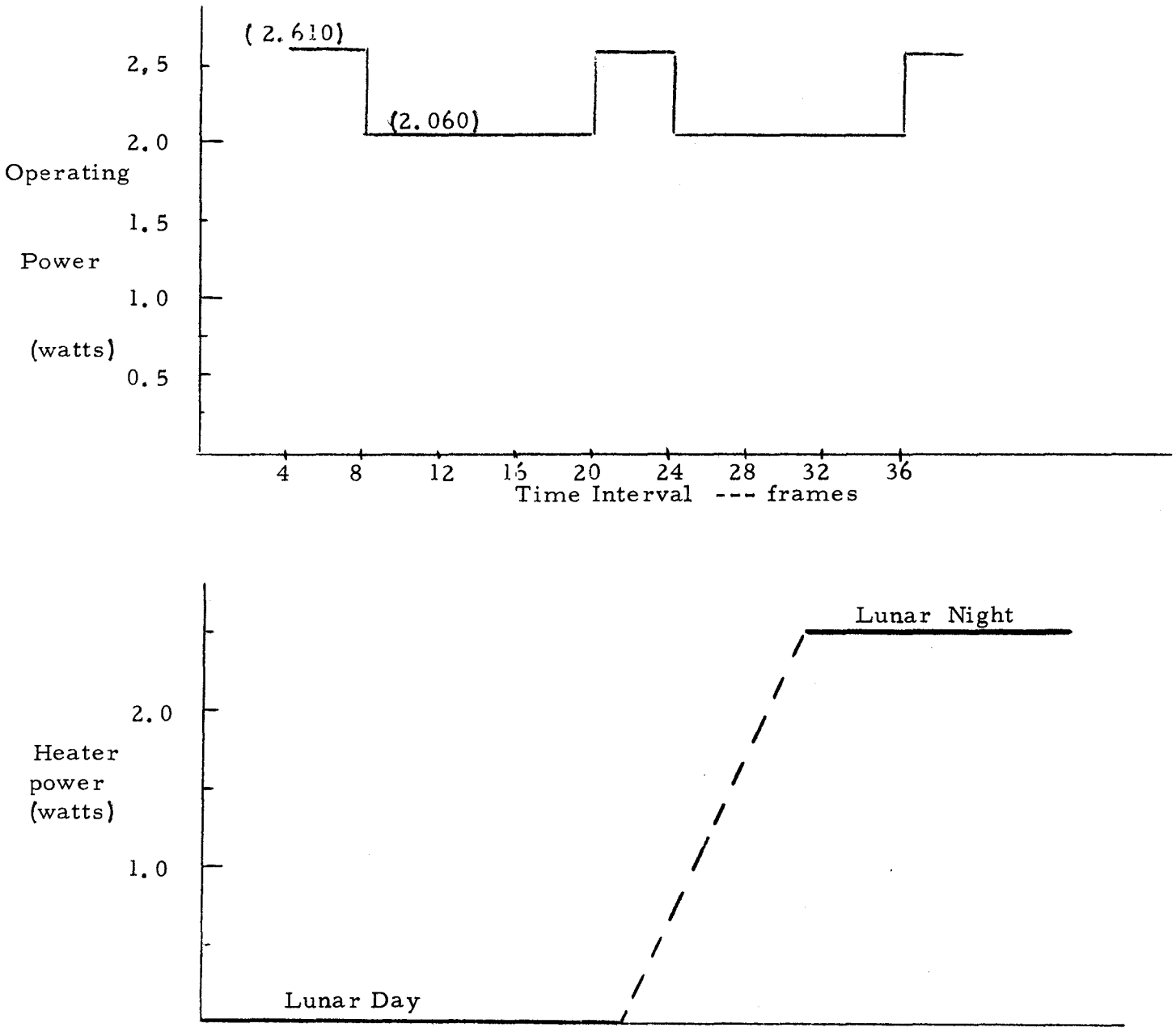

Figure 1: Power profile for the Charged Particle Experiment

FIGURE 2 : PASSIVE SEISMIC EXPERIMENT - POWER PROFILE

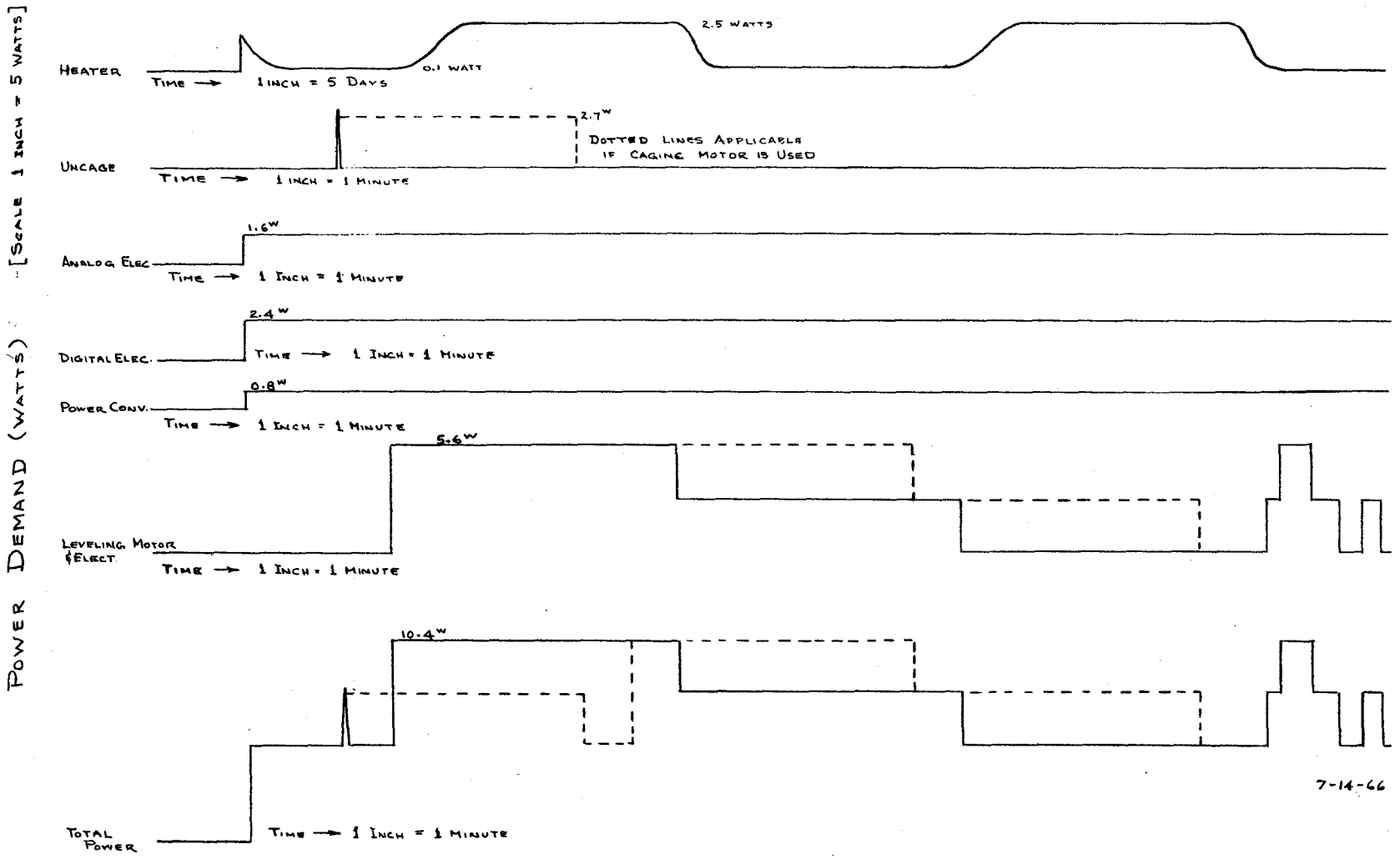

Figure 3. Power Profile for Suprathermal Ion Detector

(From: James Church, ALSEP Project Officer 7 June 1966)

"This information is tentative and necessarily lacking in detail since the circuit design of the instrument has not been completed.

Item 1: Turn-on power surge

Duration: 0.1 sec. approx.
Amplitude: 1 amp. approx.

Item 2: In normal operation

Instrument power: 4.5 watts continuous
Heater power: 1.5 watts continuous

Item 3: Variation during instrument cycle

+ 10% max. during instrument cycling

Item 4: Heater power variation

0 to 1 1/2 watts depanding on time of lunar day. Power usage will vary smoothly from 0 to the maximum and will draw less than 0.03 watt at all temperatures above 25°C inside the experiment package.

Item 5: Dust cover and CCIG Seal Deployment

Each of these devices will draw not more than 10 watts for not more than 10 sec. immediately following the deployment command.

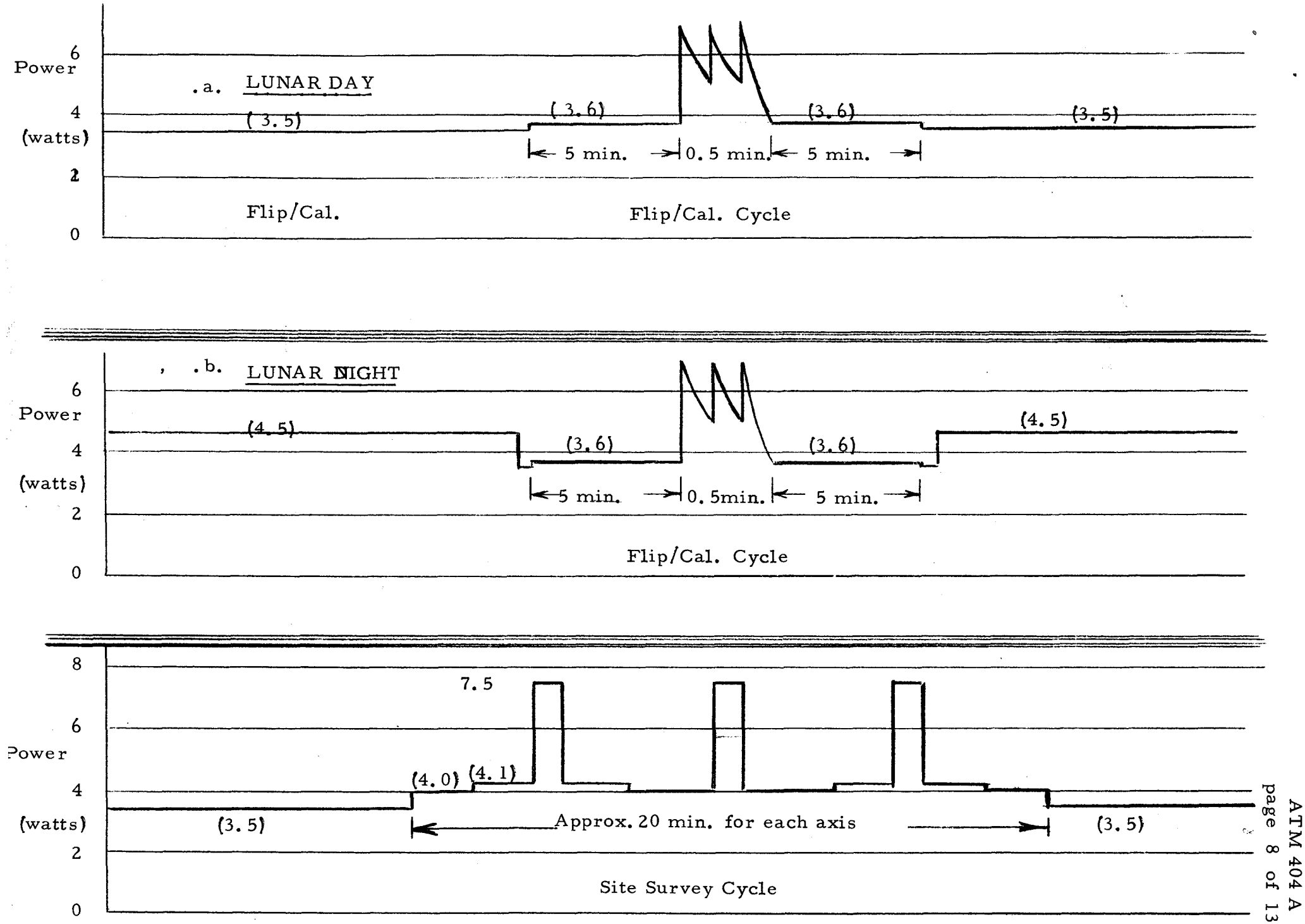

Figure 4: Power Profile of Magnetometer Intermittent Commands

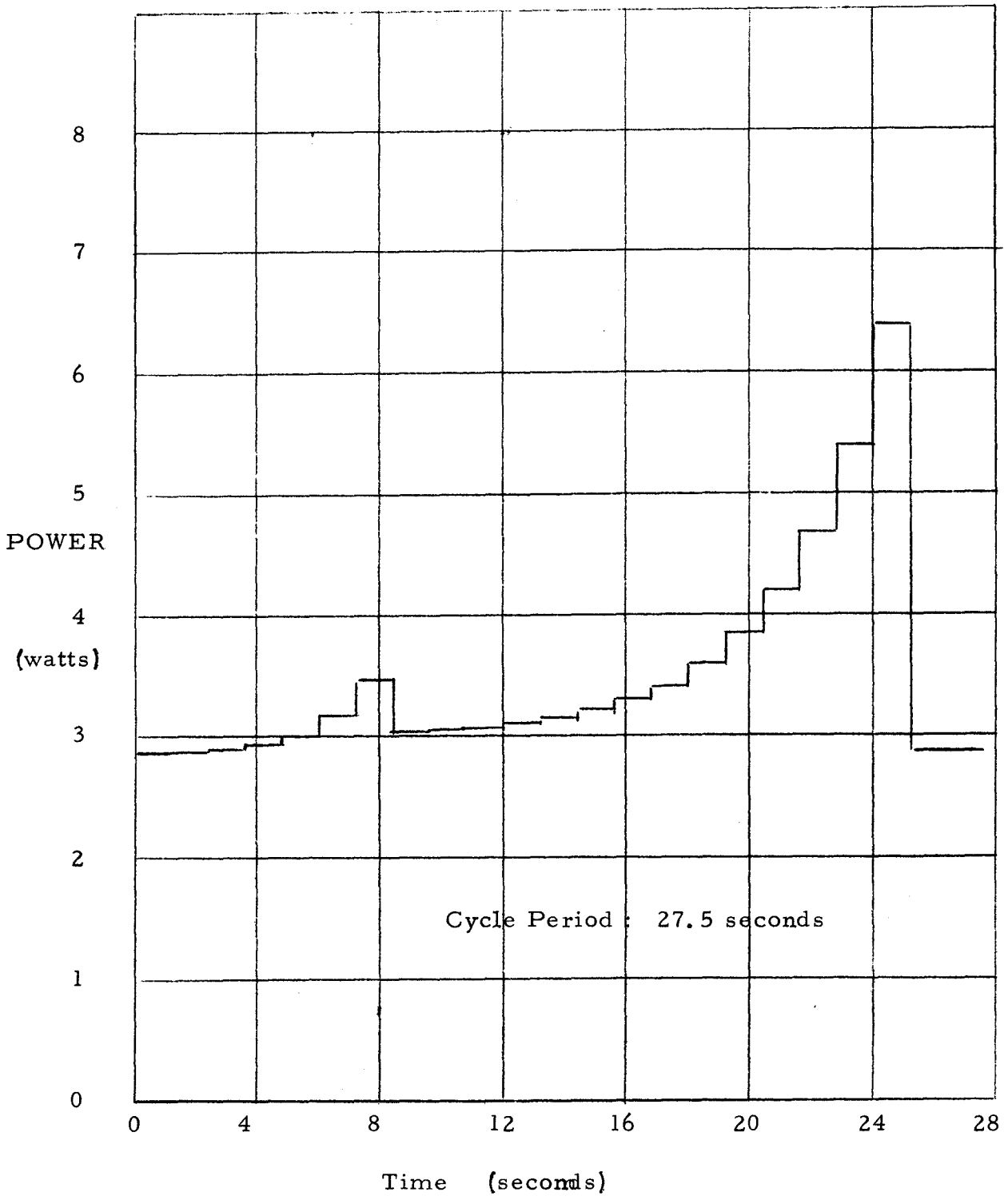

Figure 5: Power Profile for solar wind experiment

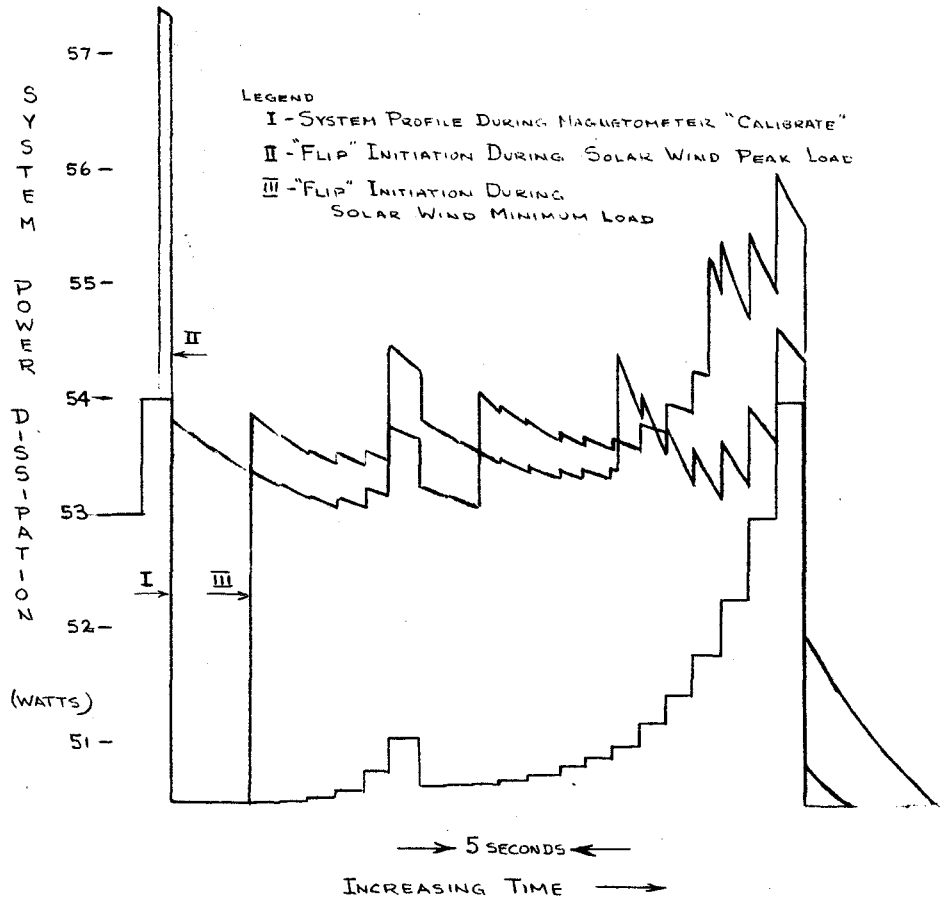

FIGURE 6a: SUPERPOSITION OF "SOLAR WIND" AND MAGNETOMETER "FLIP" CYCLES

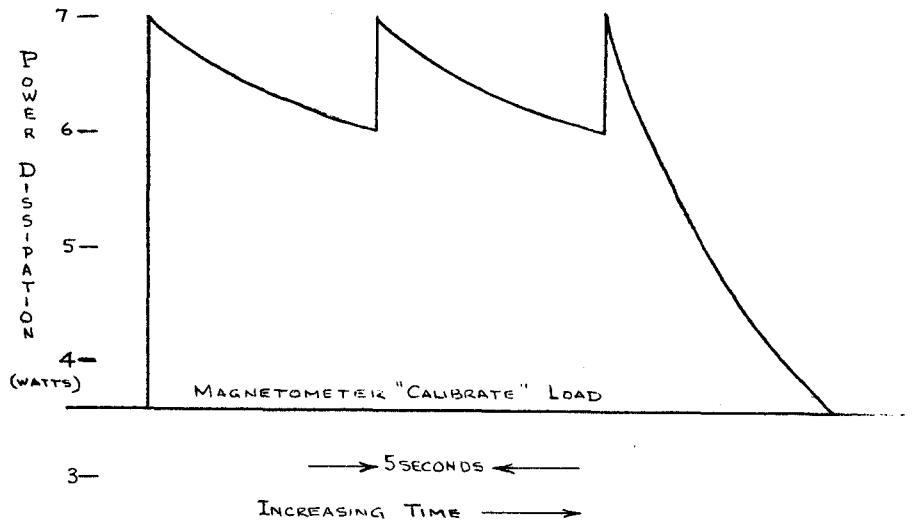

FIGURE 6b: MAGNETOMETER "FLIP" PULSE (ESTIMATED PROFILE)

HWW 25 JULY '66

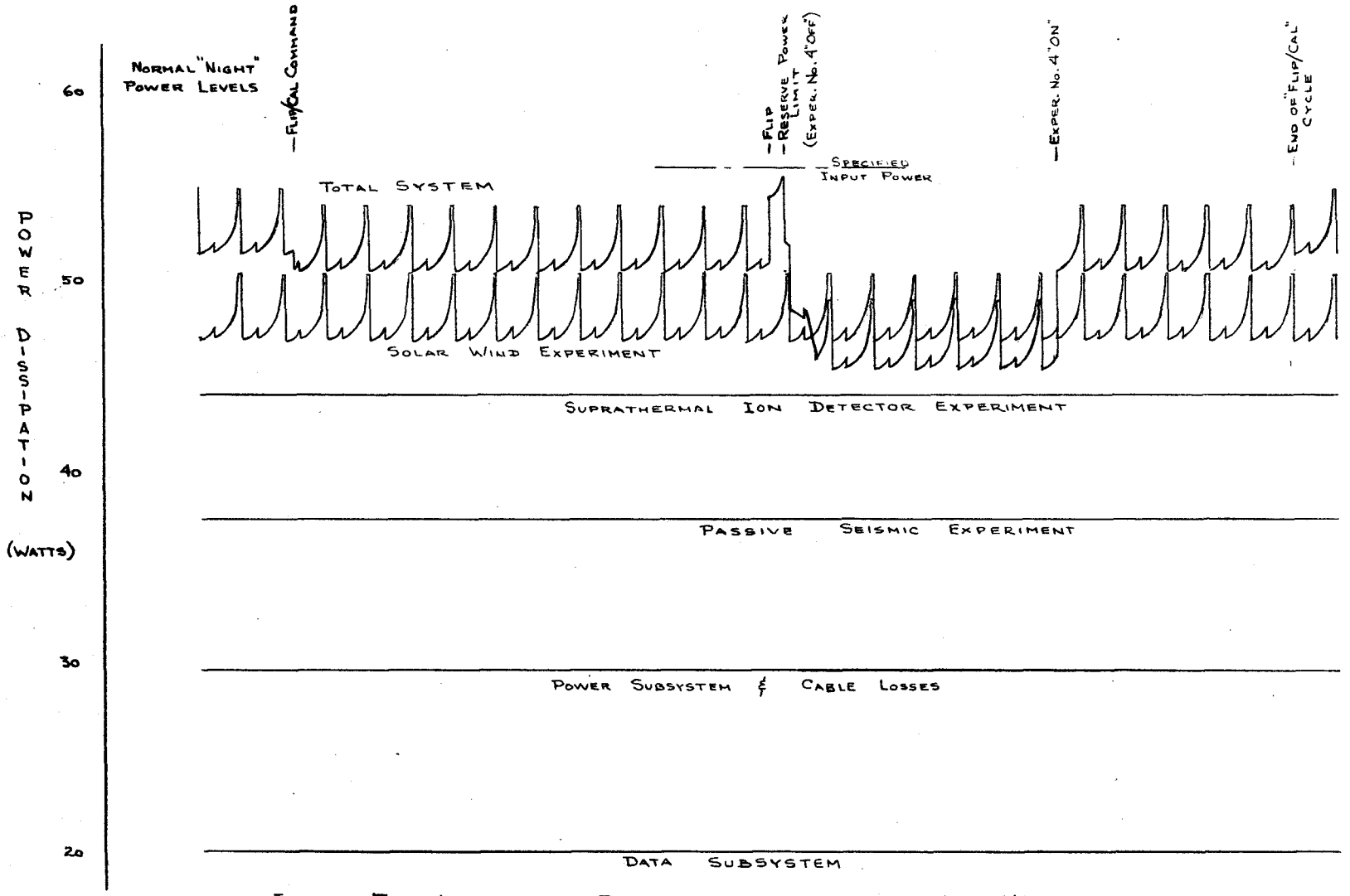

FIGURE 7 : ACCUMULATED POWER DISSIPATION - ALSEP ARRAY 'A'

25 JULY '66

1. Insert RTG Connector

2. PCU Input Energized

3. Transmitter ON

Passive Seismic
4. -ON
5. -Uncage
6. -Level

Magnetometer
7. -ON
8. -Flip/Calibrate

Suprathermal Ion Detector
9. -ON
10. -Remove Dust Cover
11. -Unseal Pressure Gage

Solar Wind
12. -ON
13. -Remove Dust Cover

Magnetometer
14. -Site Survey (3)

15. All Experiment Heaters ON

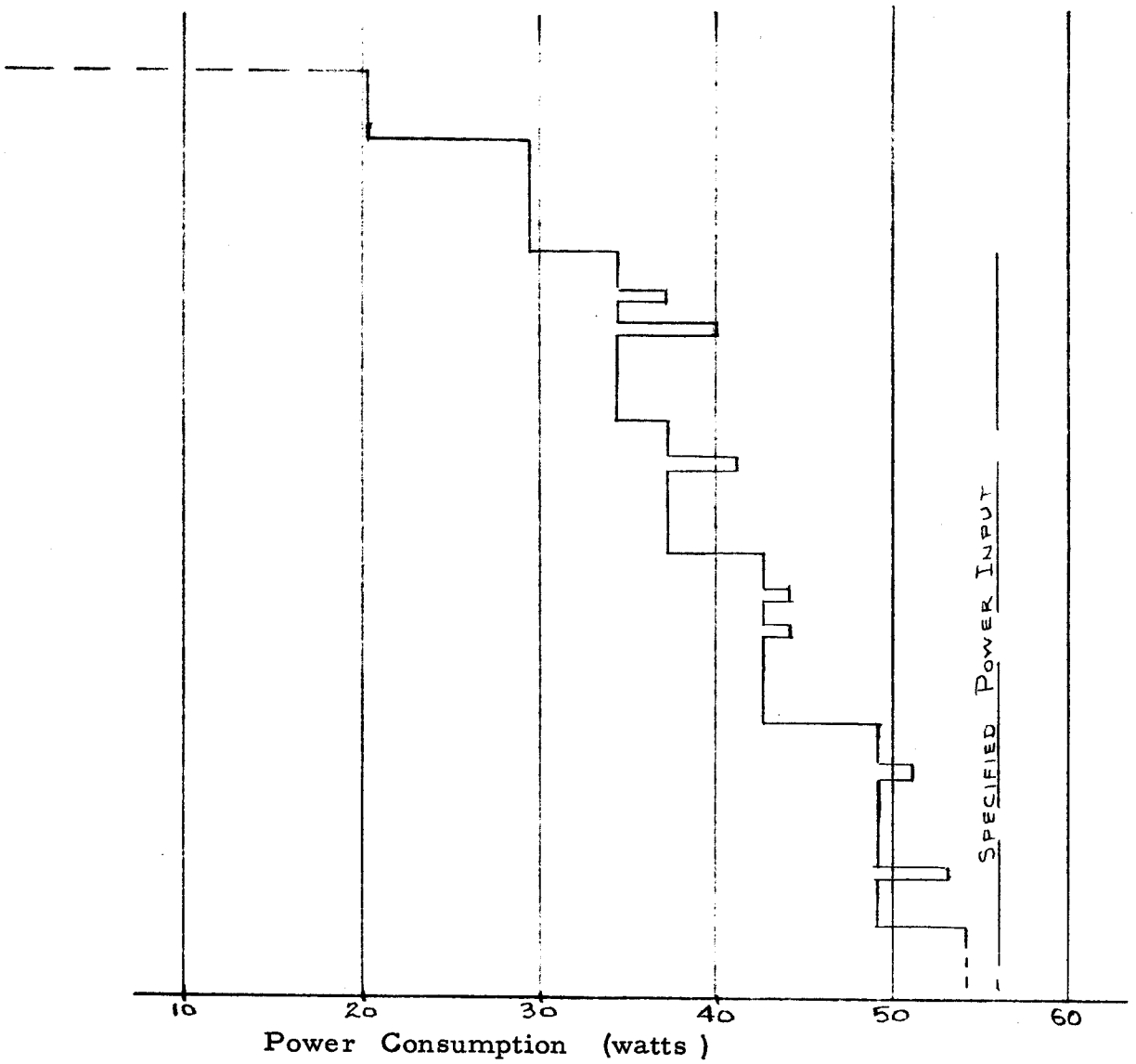

Figure 8. START-UP POWER PROFILE FOR ARRAY "A"

1. Insert RTG Connector
2. PCU Input Energized
3. Transmitter ON

Active Seismic
4. -ON (Thumper Mode)
5. -Stand-by

Passive Seismic
6. -ON
7. -Uncage
8. -Level

Heat Flow
9. -ON

Suprathermal Ion Detector
10. -ON
11. -Remove Dust Cover
12. -Unseal Pressure Gage

13. Active Experiments Heaters ON

Charged Particle Lunar Environment (Day Only)
14. -ON
15. -Remove Dust Cover
16. -Heater ON

Active Seismic (Day Only)
17. -ON (Mortar Mode)

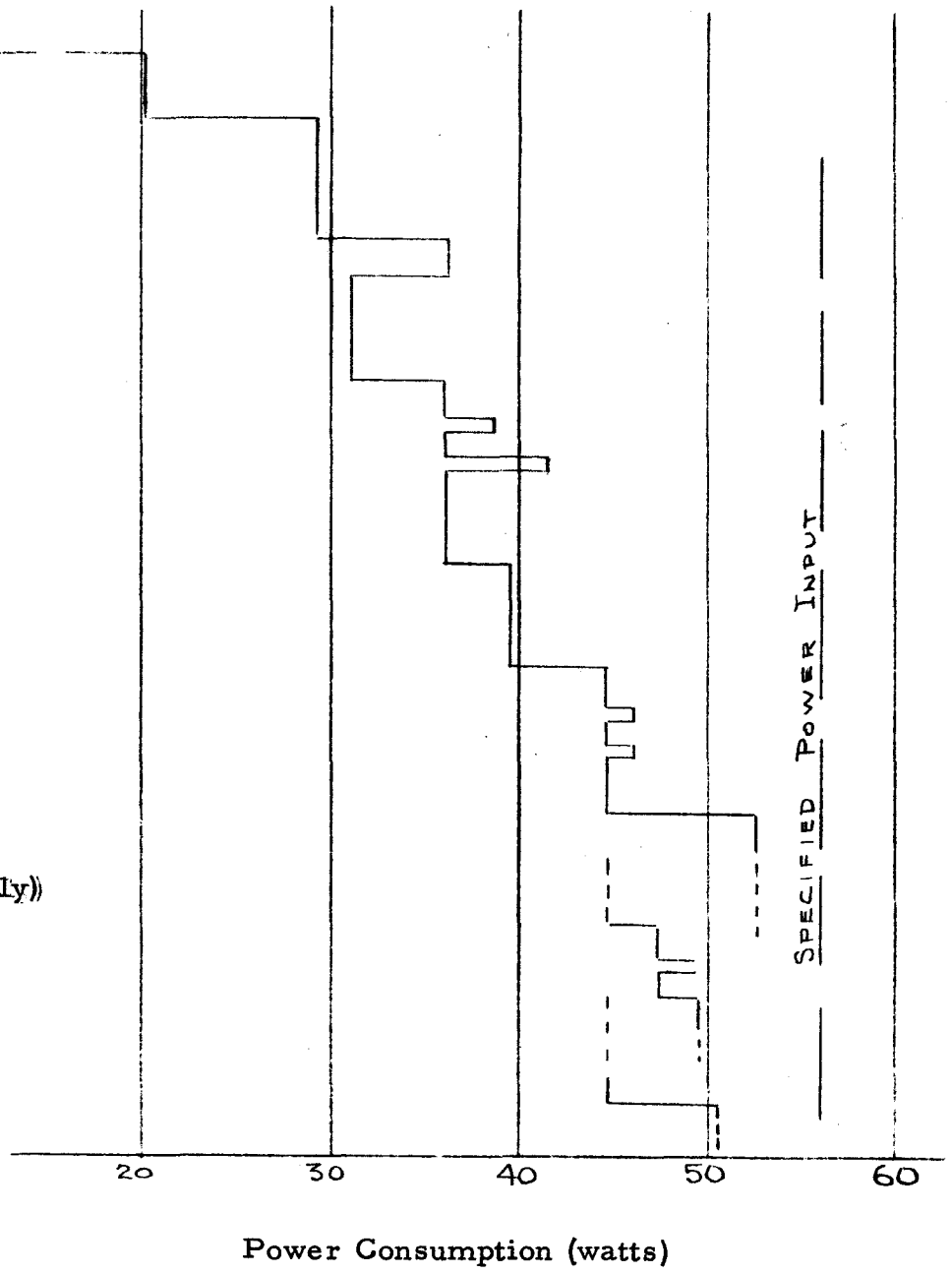

Figure 9. START-UP POWER PROFILE FOR ARRAY "B"