FINAL REPORT

BIT II MISSION 7064

19 May 1966

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1. PROGRAM OBJECTIVES.

The objective of this program is to determine if and when the AGENA vehicle is tracked by a radar operating in the 150- to 300-MHz frequency range. The BIT II system, designed to fulfill this objective, covers this VHF band with a hunt-lock on receiver which searches for strong signals having wide pulse widths characteristic of long range surveillance and tracking radars. On those signals which qualify, the system locks on to determine if the emitter is continuously tracking the vehicle. Gross parameter measurements are made during this period which enable an analyst to determine the signal characteristics for possible emitter identification.

2. MISSION SUMMARY.

2.1 Mission Highlights.

The BIT II system intercepted the [redacted] signal on 3 February from 0805:14Z to 0809:12Z during orbit 7 and on 10 February from 0740:36Z to 0743:29Z during orbit 118. The characteristics of the intercept data indicate that the emitter did not continuously track the AGENA vehicle on either occasion.

The [redacted] emitter was also noted to be active on orbit 117 during the period from 0609:59Z to 0610:51Z on 10 February. This back lobe intercept consisted of five short signal bursts which occurred during the 4 minute period as the vehicle passed north and east of Sary Shagan.

The system made numerous intercepts of several allied radars during the course of this mission which provided good operational checks on the system. These radars included the [redacted] Several TALL KING radars were also observed. There was no indication of vehicle tracking by any of these emitters.

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2.2 Flight Summary.

Vehicle Number	1623
Launch Date	2 February 1966
Launch Time	2139Z
Inclination	75 degrees
Apogee	234.5 nautical miles
Perigee	99 nautical miles
Period	90.5 minutes
BIT II System	Serial No. 1

2.3 Mission Coverage.

The mission, which was launched on 2 February, was terminated after read out on orbit 194 at approximately 0240Z on 15 February. Although originally scheduled for 200 orbits, the mission was prematurely terminated because of battery power depletion. During the mission four read out events were missed resulting in the loss of data from orbits 108-110, 126-128, and 155-159, in addition to those data from orbits 195-200 which were lost because of premature termination. The system was typically operated whenever the vehicle was above 10 degrees North latitude.. Once during each 24 hour period, it was operated during an entire orbit.

3. OPERATIONAL RESULTS.

3.1 [redacted] Intercept - Orbit 7.

Time	Vehicle Position	Altitude
[redacted]		

3.1 -- Continued.

[redacted]

3.2 [redacted] Intercept - Orbit 117.

Signal	Time	Vehicle Position	Altitude
[redacted]			

[redacted]

3.2 -- Continued.

[redacted]

3.3 [redacted] Intercept - Orbit 118.

Time	Vehicle Position	Altitude
[redacted]		

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3.3 -- Continued.

[redacted]

3.4 Other Intercepts.

[redacted]

[redacted]

4. SYSTEM PERFORMANCE.

4.1 Specifications.

(a)	Frequency Coverage	146 to 310 MHz
(b)	Receiver Detection Sensitivity	-61 dbm Low Channel -37 dbm High Channel
(c)	Receiver Bandpass	4.5 MHz
(d)	Image Rejection	50 db
(e)	Pulse Width Qualification	20 microseconds

4.1 -- Continued.

(f) Measurement Ranges

Amplitude	-61 to -30 dbm	Low Channel
	-37 to 0 dbm	High Channel
Pulse Interval	3 to 100 milliseconds	Low Channel
	2 to 50 milliseconds	High Channel
Pulse Width	20 to 2000 microseconds	
Pulse Count	50-1500	Non-Qualified
	10-500	Qualified
Discriminator Range	-5 to +3 MHz centered at 70 MHz	

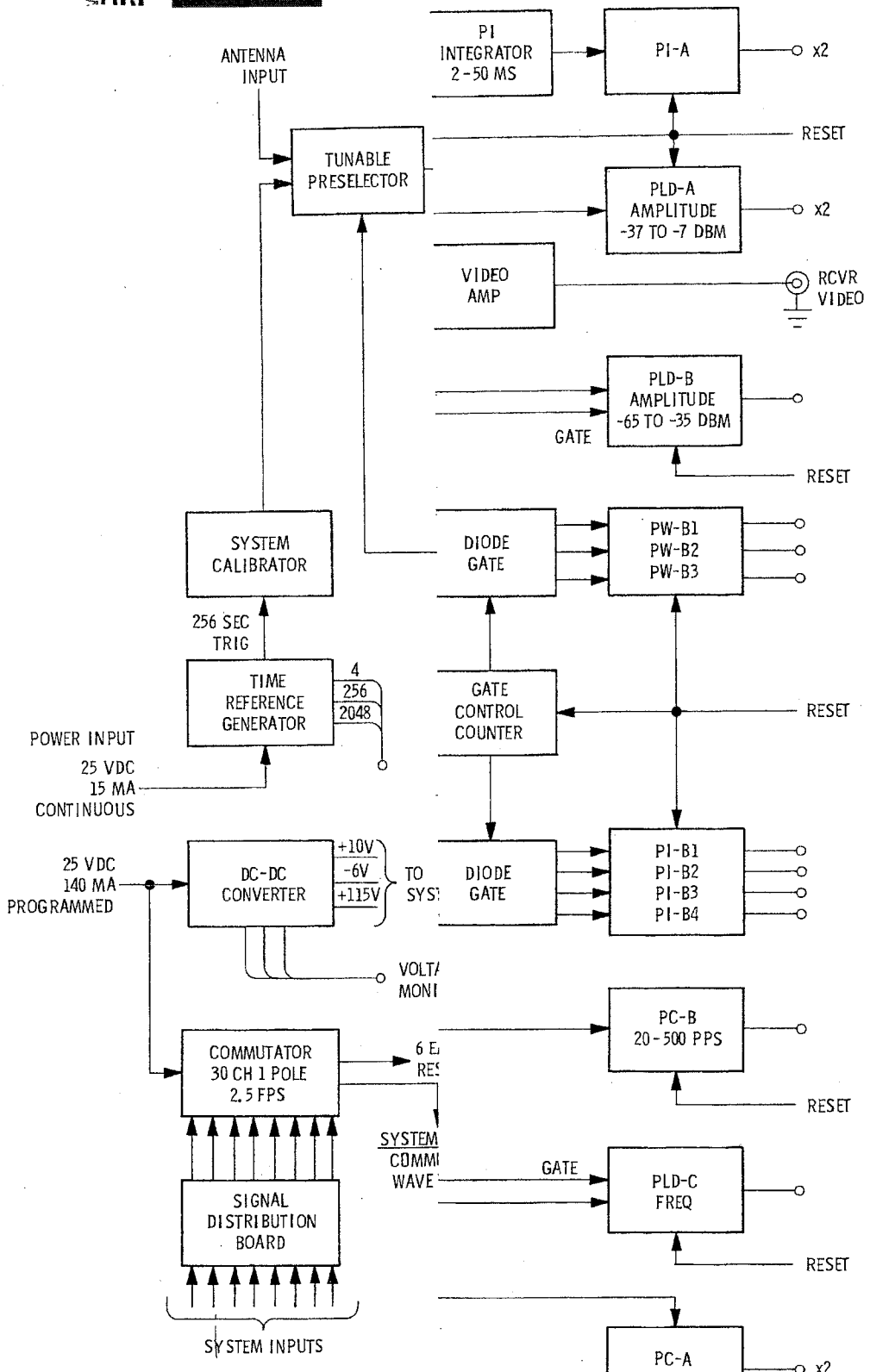
(g) Duration of Sweep Lock 4.5 seconds

4.2 System Operation.

A general description of the BIT II system is given in the Appendix of the Final Report for Mission 7063. The system block diagram is shown in Figure 2.

The BIT II unit used on this mission functioned properly throughout the mission. The abnormal susceptibility to noise generated by the unit itself and by the vehicle was greatly reduced in comparison to the unit used on Mission 7063. It was, however, still susceptible to false pulse qualification in dense signal environments. This was caused by an approximate 15 microsecond decay time in the pulse width qualifier. If narrow pulses occurred sufficiently close together, such as three 5 microsecond pulses each separated by 5 microseconds, the PWQ integrator would not fully discharge at the end of each pulse and the circuit would eventually charge up to the qualification point. To correct this condition in all subsequent units, the PWQ integrator was modified so that it would be actively discharged at the end of each pulse. The decay time of the modified circuit is now less than 0.5 microsecond.

The BIT II system used on this mission and the systems to be used on subsequent flights are subject to generating misleading frequency and amplitude measurements when signal parameters are being measured in dense signal environments. When measuring the parameters



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4.2 -- Continued.

of a signal such as [redacted] a 10-microsecond read gate is opened during each qualified pulse. If a narrow pulse is received simultaneously with this read gate, the amplitude and frequency measurements will be affected. The amplitude measurement will be increased by an amount dependent on the amplitude of the narrow pulse relative to the qualified pulse. The frequency measurement will respond to the higher of the two frequencies. Since the peak level detectors store the maximum values of these two parameters measured during a 400-millisecond commutator read in period, only one pulse in twenty (PRF of 50 pps) is required to have a simultaneous intercept with a narrow pulse in order to falsify the information. In a dense environment, this condition is very likely. The only way to significantly reduce this possibility of these erroneous measurements is to reduce the width of the read gate to the 5 microsecond minimum value and to modify the measurement circuitry so that the measurements would be made on only one pulse during each commutator read in period rather than taking the maximum reading during this period. This would not only have the advantage of reducing the probability of false measurements, but it would also tie all of the measurements to a particular pulse. This characteristic of the parameter measurement circuitry does not detract from the system's primary function of determining if the AGENA vehicle was tracked, but it does impair the capability to measure signal parameters in the presence of interfering signals.