FINAL REPORT

BIT MISSION 7054

5 FEBRUARY 1965

~~SECRET~~
SPECIAL HANDLING

FINAL REPC
BIT MISSION 4

1. (S) MISSION SUMMARY.

1.1 (S) Program Objectives.

As part of the over-all problem of determining the vulnerability of the Agena satellites to Soviet radar detection and tracking, the objective of the BIT program is to determine if and when the radar system associated with the signal [redacted] acquires and tracks the Agena vehicle. The BIT system, designed to fulfill this objective, covers the frequency range from 153 to 163 Mc and accepts only those signals which have characteristics similar to [redacted] On those signals which qualify, the system will measure frequency, PRF, and signal amplitude along with the time of intercept to enable an analyst to identify the signal characteristics and to estimate a geographical area within which the emitter is located.

1.2 (S) Mission Highlights.

No signals of interest were intercepted during the effective mission life which started with orbit 1 and lasted until orbit 206. Data were not recorded from orbit 89 through orbit 137 because the vehicle was temporarily deactivated during this period. Data were not recovered from orbits 33 and 142 due to tracking station problems. The Signal Simulator and Activity Indicator in the BIT showed that the system was functioning properly during the entire mission for which data were available.

1.3 (S) Flight Summary.

Vehicle Number	1607
Launch Date	19 December 1964
Launch Time	2117 GMT
Inclination	75 degrees
Apogee	234.4 nautical miles
Perigee	98.4 nautical miles
Period	90.5 minutes

2. (S) DATA ANALYSIS.

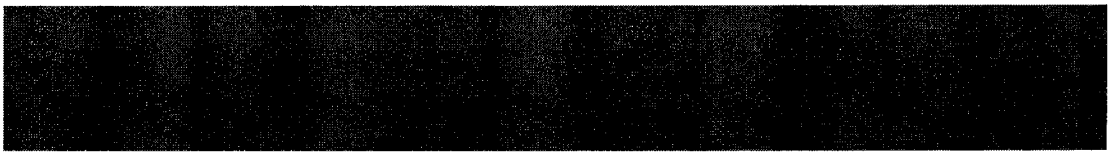
2.1 (S) System Coverage.

The BIT system was programmed on during 160 orbits of the 206-orbit mission life while the vehicle was over the northern hemisphere with an emphasis on the coverage over Europe, the USSR and Asia. On 21 occasions, the unit was on throughout the period while the vehicle was over the southern hemisphere.

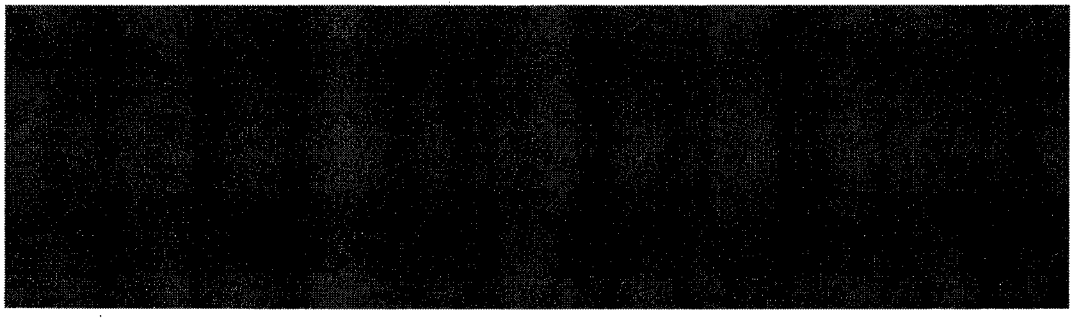
The system monitors the 153- to 163-Mc frequency range with a receiver sensitivity of -53 dbm. With the inclusion of the antenna pattern, the over-all system sensitivity varies from approximately -43 dbm at the horizon to -51 dbm looking straight down. Signals intercepted by the system are rejected by qualification circuitry if the pulse widths are less than 14 microseconds and if the PRFs do not fall within the 95- to 101-pps PRF acceptance band or harmonics of this band. The system measures amplitude, frequency, and PRF on those signals which qualify. If a signal has a power level at the receiver of -26 dbm or greater, it will also be fed into a high level channel which requires no qualification other than amplitude and which measures only the signal amplitude.

2.2 (S) Mission Results.

2.2.1 (S) Qualified Intercepts.



2.2.2 (S) Nonqualified Intercepts.



2.2.2 (S) -- Continued.

[redacted]

[redacted]

3. (S) SYSTEM PERFORMANCE EVALUATION.

3.1 (S) System Description.

A block diagram of the BIT system is shown in Figure 1 although it is labeled by its in-house name of FIRE BOX. It is basically a TRF (tuned radio frequency) receiver with video logic for signal recognition and circuits for parameter measurement. An intercepted signal which exceeds the Detector B threshold of -53 dbm is amplitude standardized in the video threshold circuit and then qualified. If the pulse width is greater than 14 microseconds, the signal will be passed to the Pulse Rate Counter (PRC) and the PRF Qualifier. The PRC counts the total number of pulses received during one commutator read-in cycle (400 milliseconds) and the PRF Qualifier examines the pulse train for a PRF of 95 to 101 pps or harmonics of this PRF range. It the PRF qualifies, a pulse-by-pulse gate is generated which opens the two gates to permit the Peak Level Detectors (PLD) to read amplitude and frequency. The PLD's store the lowest frequency and the highest pulse amplitude intercepted during the 400-millisecond read-in period. If the signal level exceeds -26 dbm at the receiver, the signal amplitude will be read in the Detector A channel without qualification. A Time Reference Generator provides a parallel octal time code reference for the system. It is also used to trigger the Signal Simulator on for four seconds every 256 seconds. The Simulator generates a 98-pps signal at a frequency of 160 Mc and a power level of -28 dbm which is used to list the system for proper operation plus providing a one-point calibration check of the system.

A Signal Activity Indicator, designated as PRC-B, has been added to the system to provide a check on the operational status of the antenna and the RF input line. The circuit, which is connected

FIRE BOX SYSTEM

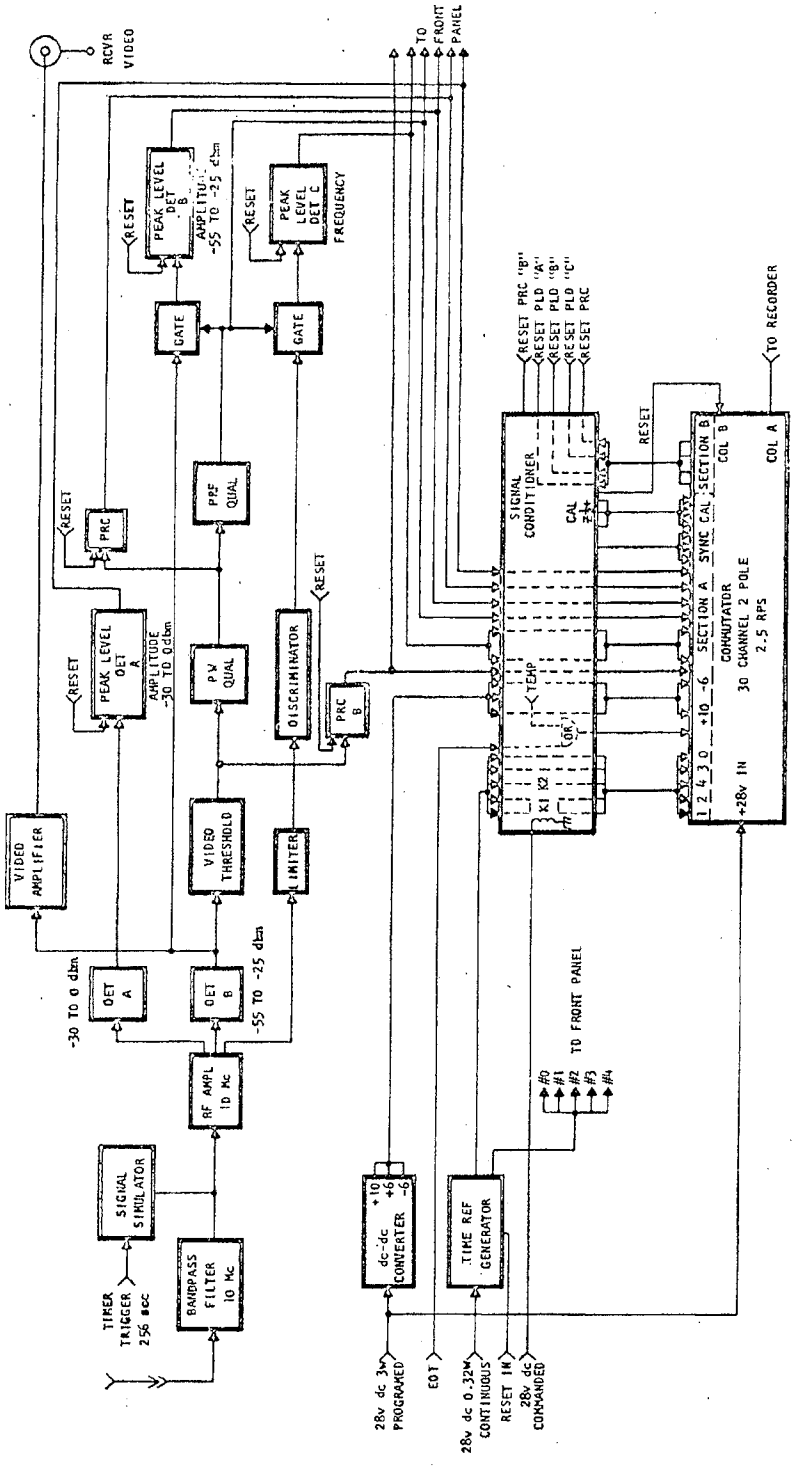


Figure 1

3.1 ~~(S)~~ -- Continued.

to the output of the Video Threshold circuit, counts every pulse received regardless of pulse width or PRF. Since it is primarily intended to indicate the presence of activity and it is an "add on" modification, no attempt was made to achieve accurate pulse count measurements.

A summary of the system specifications for the BIT system used in this mission is given below.

Minimum Detectable Signal	-53 dbm (PLD-B) -26 dbm (PLD-A)
PRC Minimum Acceptable Pulse Width	14 microseconds
Frequency/Amplitude PLD Minimum Pulse Width	23 microseconds
PRF Qualifier Acceptance Range	95-101 pps (Fundamental) 191-201 pps (2nd Harmonic)
RF Passband at -50 dbm	152.9 to 163.3 Mc

3.2 ~~(S)~~ System Performance.

The BIT system performed as designed for the duration of the useful life of the mission. Comparison of the system's response to the Signal Simulator during the mission with its response prior to launch showed that the detection sensitivity and the calibrations for frequency, amplitude, and PRF maintained their original levels. The system's operating temperature was 59 degrees Fahrenheit during the mission. No malfunctions were noted.