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FINAL REPORT

BIT MISSION 7057

26 May 1965

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1. (S) MISSION SUMMARY.

1.1 (S) Program Objectives.

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.

On orbit 8 of this mission the BIT system intercepted an unidentified signal as the vehicle passed approximately 420 nautical miles due west of Sary Shagan. Because of the location of the vehicle during the intercept and the power level of the signal, it is suspected that the emitter may be the same as the [redacted] emitter; however, the signal cannot be identified as [redacted] because of the PRF. The signal, which was intercepted from 0902:49Z to 0904:46Z on 26 March, had sufficient signal strength to permit the detection of the Agena vehicle by the emitter. This detection and possible tracking event occurred only during an 18-second period when the signal strength reached a level of -22 to -13 dbm at the vehicle and the PRF was steady at an average rate of 85 pps.

No other signals of interest were noted during this mission which was prematurely terminated by a commutator failure sometime after orbit 33. The BIT system was functioning properly throughout the useful life of the mission which started with the vehicle launch at approximately 2100Z on 25 March and ended sometime after 2200Z on 27 March 1965.

1.3 (S) Flight Summary.

Vehicle Number	1612
Launch Time	2118Z
Launch Date	25 March 1965
Inclination	96 degrees
Apogee	154 nautical miles
Perigee	100 nautical miles
Period	89 minutes

2. (S) MISSION COVERAGE.

2.1 (S) Operational Coverage.

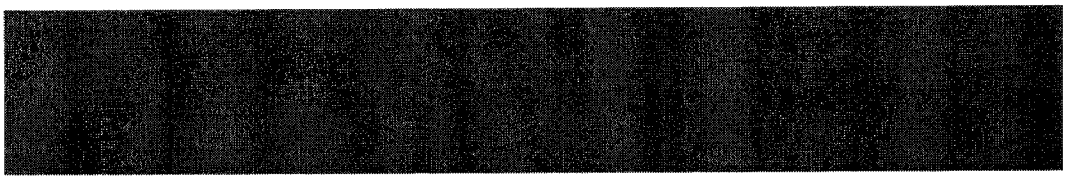
The BIT system was programmed on during each of the first 33 orbits of the useful mission life while the vehicle was over the northern hemisphere with an emphasis on the coverage over Europe, the USSR, and Asia. On 4 of the orbits the unit was programmed on throughout the period while the vehicle was over the southern hemisphere. Data were received from all of the orbits which were programmed for operation.

2.2 (S) System Coverage.

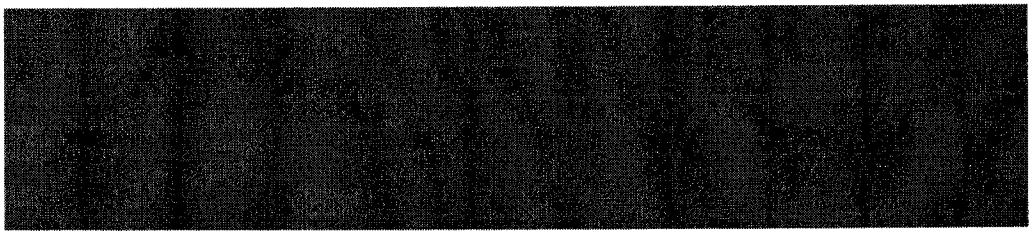
The BIT system, shown in Figure 1, monitors the 155 to 162 Mc frequency range with a receiver sensitivity of -54 dbm. With the inclusion of the effects of the antenna pattern with different polarizations and aspect angles, the over-all detection sensitivity of the system ranges from -57 dbm to -45 dbm. Signals intercepted by the receiver are checked by a pulse width qualifier to determine if the pulse width is greater than 18 microseconds. The pulses which qualify are counted in a total pulse counter, PRC, over the commutator read-in interval of 400 milliseconds and checked to determine if the PRF falls within the 94 to 101 pps acceptance band or harmonics of this range. The system measures pulse amplitude and RF frequency on those pulses which satisfy the PRF criterion. If a signal has a power level at the receiver in excess of -30 dbm, its amplitude will be measured in the PLD-A channel regardless of PRF or pulse width. The RF frequency of the high amplitude pulses will not be read unless the signal also satisfies the pulse width and PRF criteria.

3. (S) MISSION RESULTS.

3.1 (S) PRF Qualified Intercepts.



3.2 (S) Non Qualified Intercepts.



FIRE BOX SYSTEM

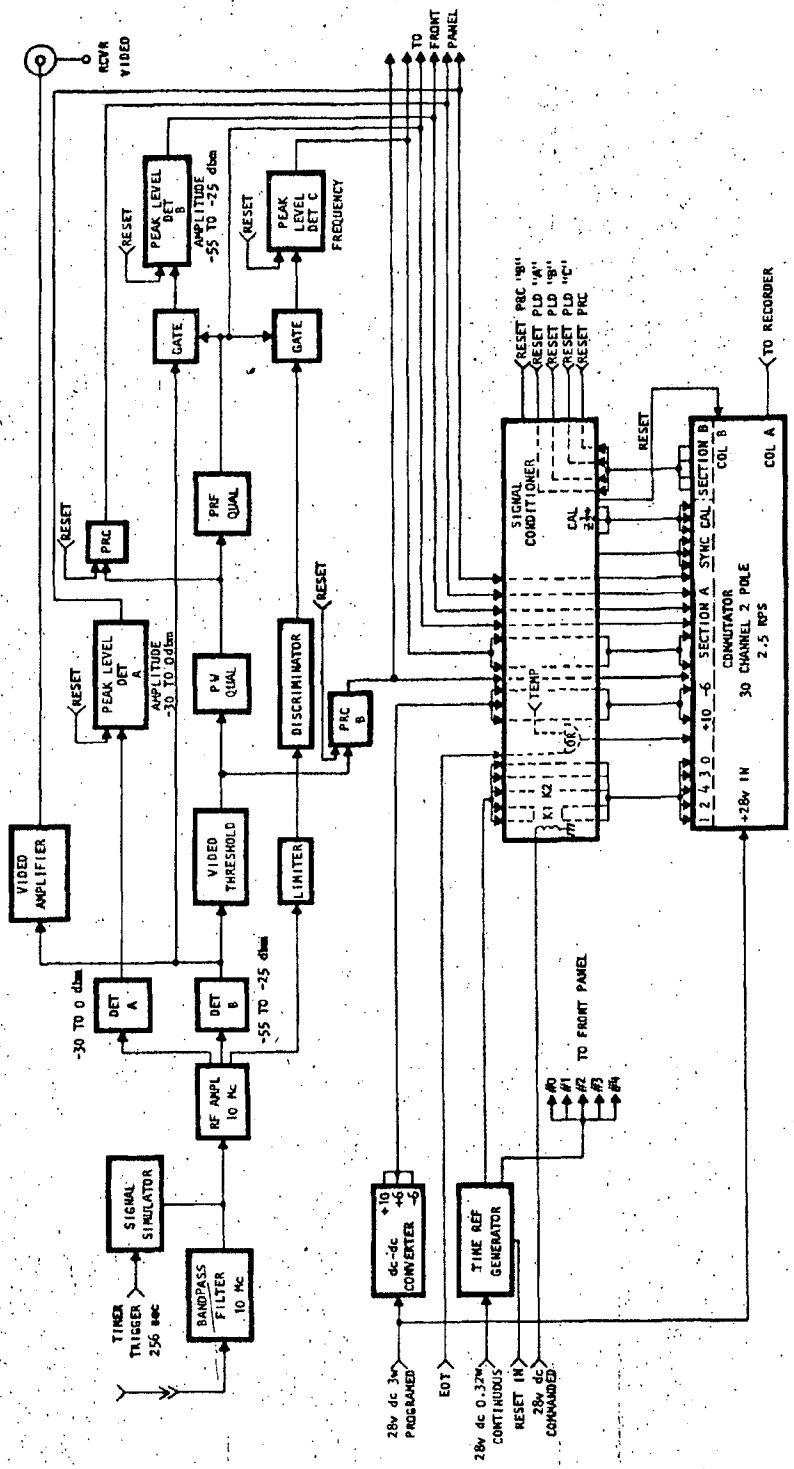
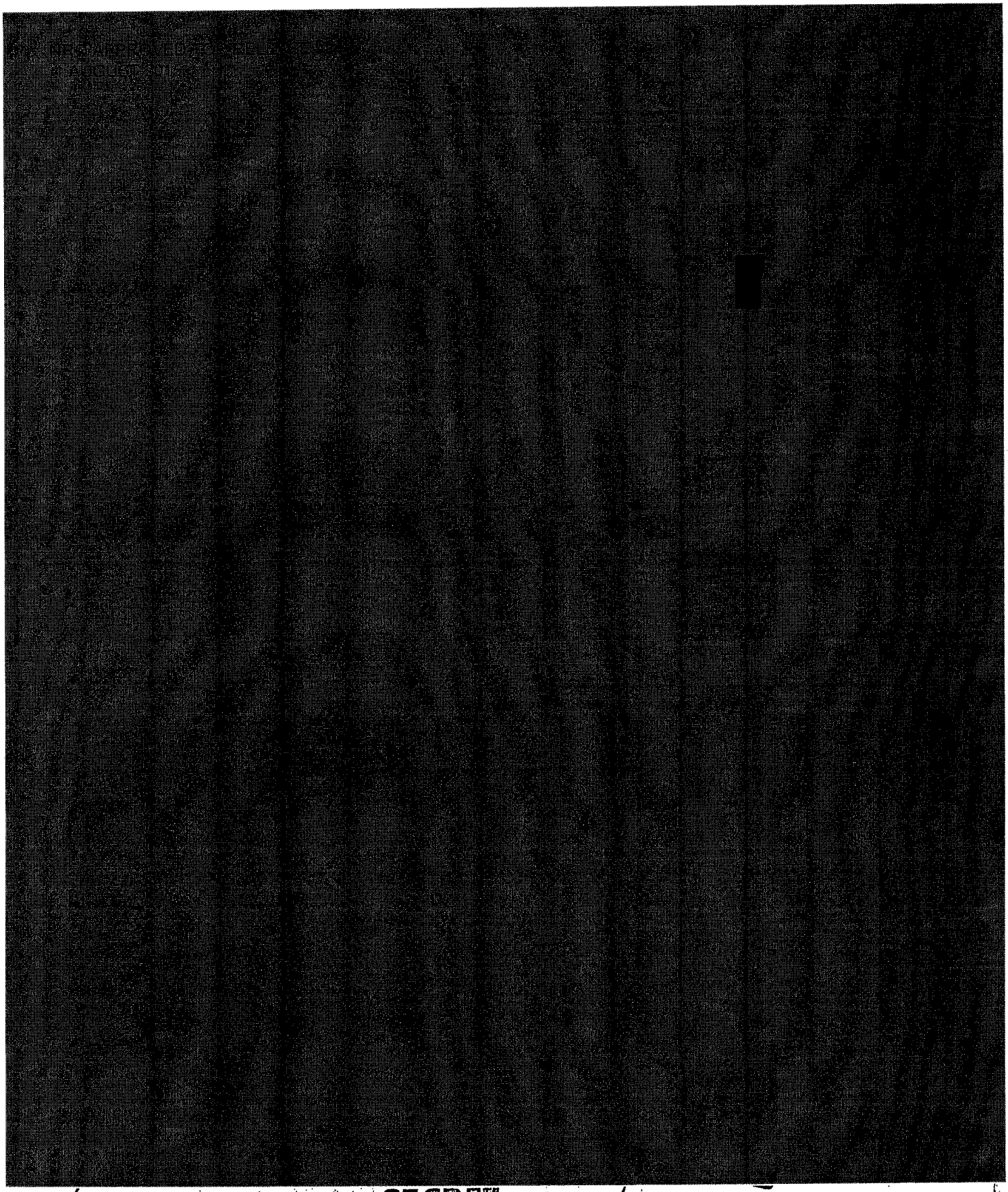


Figure 1



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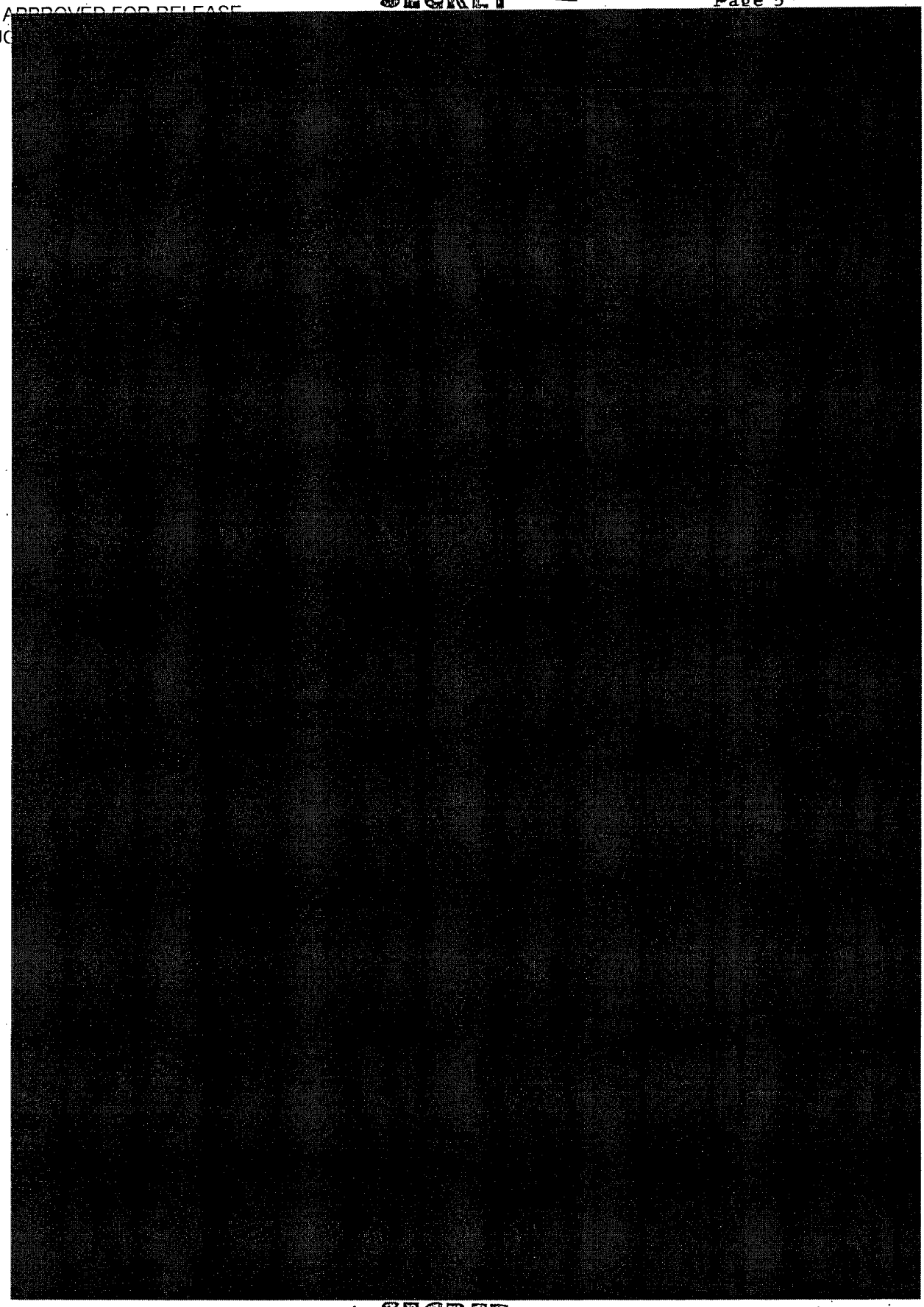

Figure 3

3.2 ~~(S)~~ -- Continued.

[redacted]

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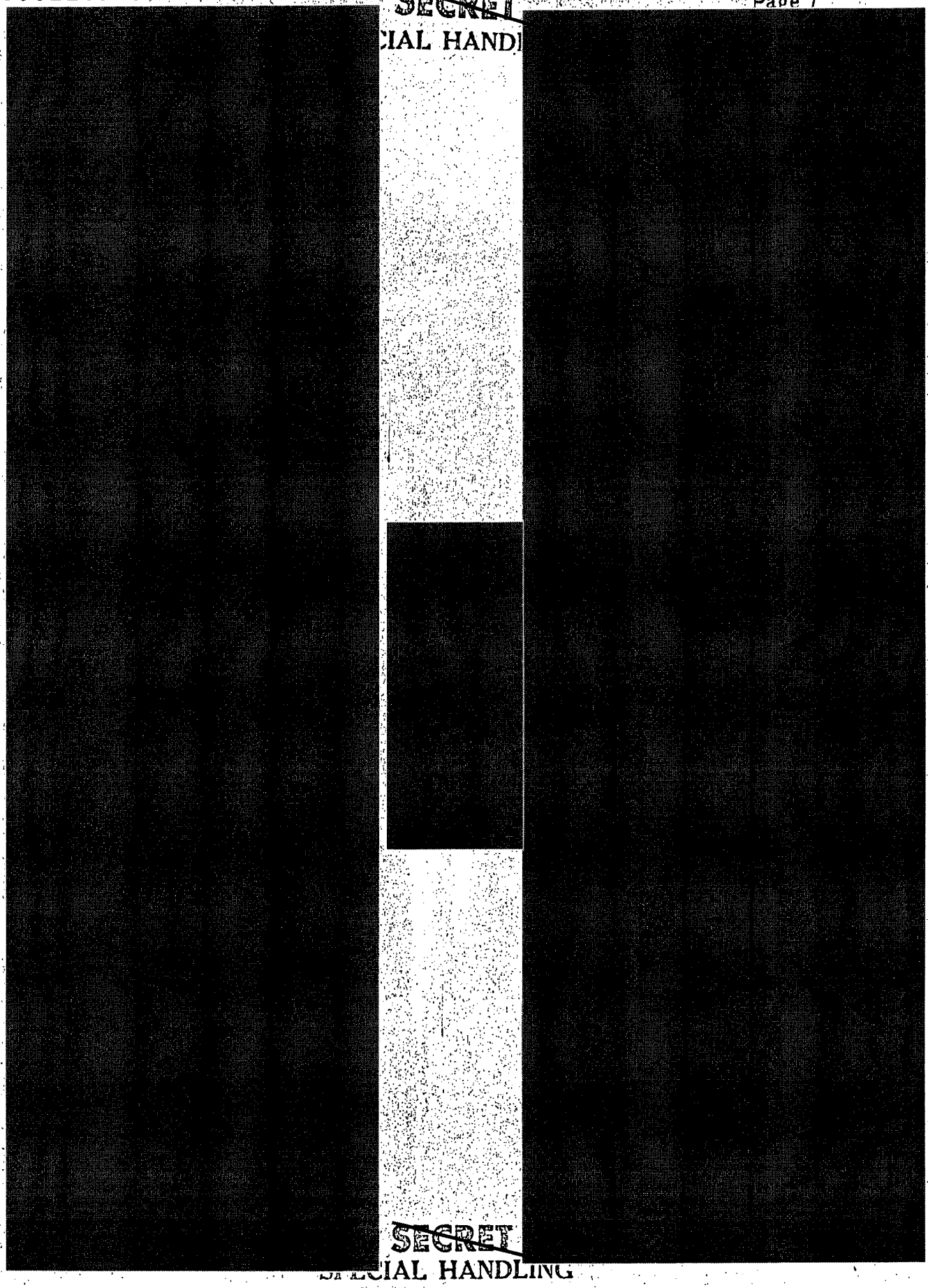

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Figure 4

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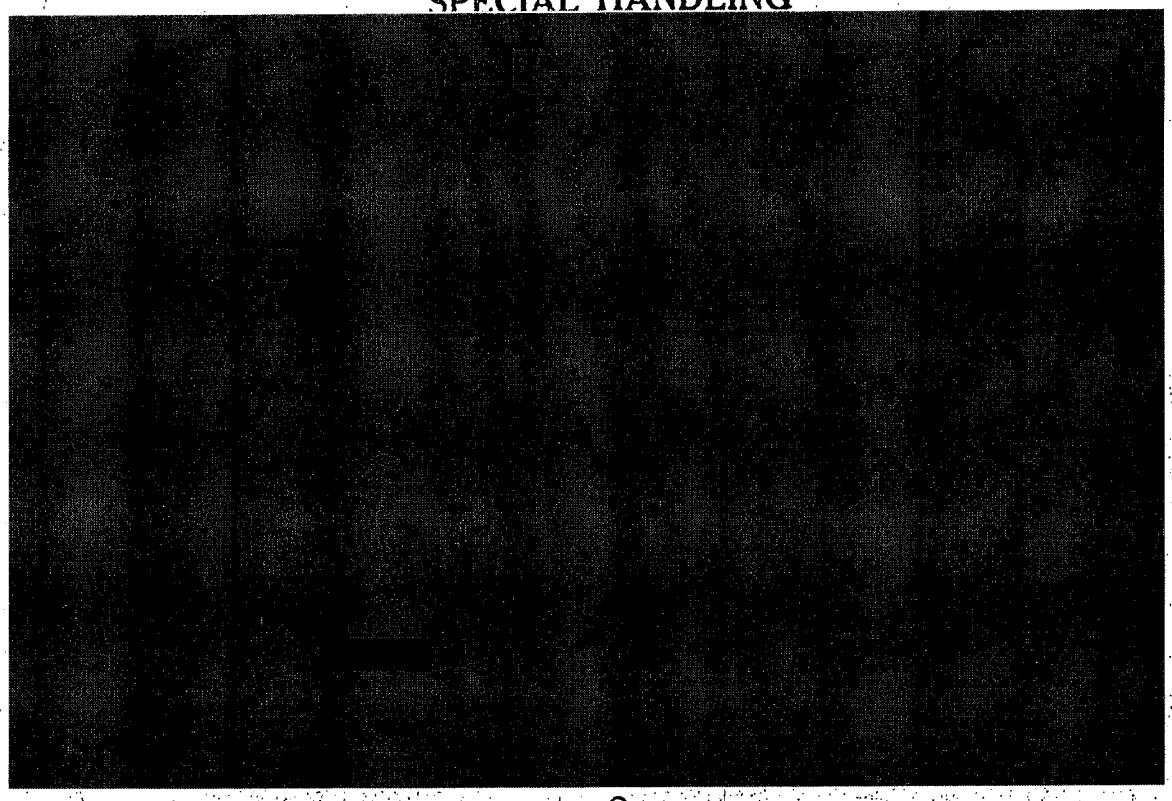

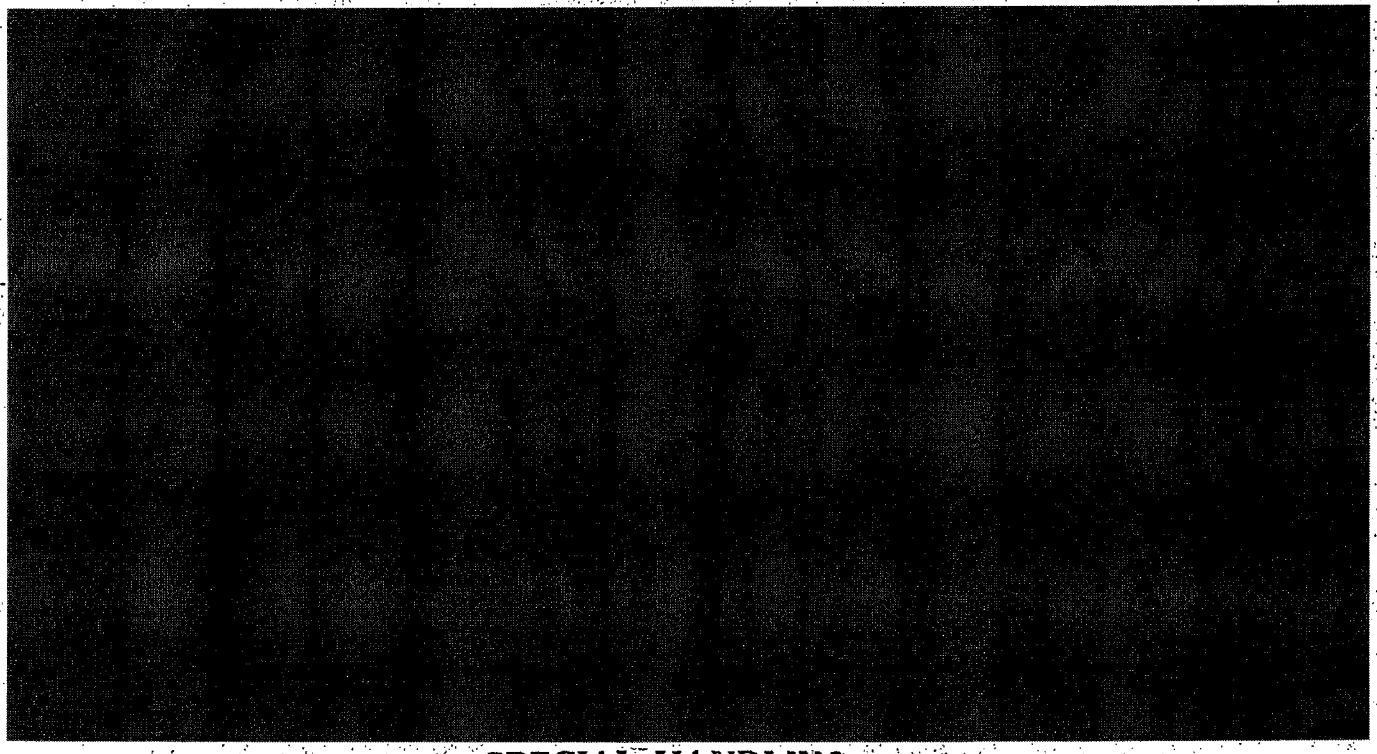

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Figure 5

3.2 (S) -- Continued.

[redacted]

[redacted]

[redacted]

4. (S) SYSTEM PERFORMANCE.

4.1 (S) System Specifications.

A summary of the system specifications for the BIT system used on this mission is given below. A block diagram of the system is shown in Figure 1.

4.1 (S) -- Continued.

Minimum Detectable Signal	-54 dbm PLD-B -30 dbm PLD-A
Minimum Acceptable Pulse Width	18 Microseconds
PRF Qualifier Acceptance Range	94-101 pps 187-203 pps (2nd Harmonic)
RF Passband -51 dbm -25 dbm	 155.7 to 161.6 Mc 148.3 to 174.5 Mc

4.2 (S) System Operation.

The BIT system functioned normally throughout the useful mission life which ended after orbit 33 when the commutator failed. From the commutator wavetrain data it is apparent that the commutator started when the system was turned on for read in on orbit 34 but it jammed and stopped on one of the synch channels after one commutator revolution. Thus, for the remainder of the scheduled mission, the output of the system remained at 5.3 volts on both stored time (channel F VCO) and real time (channel 14 VCO) read outs.

The cause of these failures in the electromechanical commutators has been identified to be poor design in the motor brush assembly and several corrective measures have been taken by commutator manufacturers to prevent similar failures in the new models. This, however, will not solve the problem with the remaining BIT commutators which were built prior to the correction of this problem. The only effective solution to the problem of the BIT commutators is the replacement of the existing units with new commutators which utilize recently developed roller bearing brush assemblies. These devices have recently been extensively tested by Lockheed and it was found that they are highly reliable. Since, as of this date, there are only three BIT units remaining, the flight schedule for the units would be interrupted if the commutators were to be replaced in the three systems. As a partial solution to the problem, the commutators have been rewired in the remaining BIT systems so that they will operate continuously rather than being programmed on and off with the system. It is hoped that this will improve the operational reliability of the commutators.