

G. L. Silver

MEE/IL
Apollo Guidance and Navigation
System Test Group Memo #386

TO: L. S. Wilk
FROM: G. L. Silver
DATE: 21 April 1965
SUBJECT: IMU & AGC WARMUP TIME REQUIREMENTS
REFERENCE: Data Book Information Request NAA-R-4, dated 11/3/65

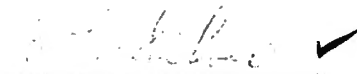
There are certain ground rules which can be used to define the warm-up time necessary. These presently apply to Block I, Series 0,50,100 & Block II.

- A. The IMU should be in Standby for at least two (2) hours before operate power is applied. This requirement exists due to the 1/2 hour time constant of the PIPA axial suspension, which require three (3) to four (4) cycles to stabilize if the float was in the axial stop when standby was applied.
If Block II goes to 4V 3200 on the PIP's this time could be extended.
- B. The IMU should be in operate for one (1) hour before inertial component calibration tests or temperature control tests are started. This requirement was generated to allow thermal stabilization in operate Mode and therefore partial circumvention of the thermally related uncertainties in the PIP. Other tests related to the IMU have no minimum time requirement except that the PSA cooling water be within specified limits.
For example: Coarse Align or Mode control tests could be started as soon as operated power is applied and proper voltage current relationships confirmed.
- C. The AGC has no warmup requirements if the cold-plate temperature is within the limits specified for computer operation.
- D. The PSA warmup time is not crucial. A period of 15 minutes should be allowed before 1% power supply tests are started, assuming the cooling water supplied is within limits.

The NAA-R-4 questions can then be answered as follows:

- Question 1. two hours: If S/C heater power is removed for time "T" (less than two hours) the time in Standby should equal "T" before operate is again applied. If "T" is greater than two hours a Two hour "standby" period is required.

- Question 2. (a) Block I Series 0, two hours assuming that S/C IMU Heater power is applied at the same time. The AGC must be "on" during the two hour S/C IMU Heater period (IMU Standby).
- (b) Block I Series 50 & 100 the AGC must be advanced to operate before the IMU to provide the PIPA interrogate pulses, no time requirement as long as the AGC is in operate before the IMU. (The AGC timing is self-starting.)
- Question 3. (a) One hour for PIP/GYRO parameter measurements.
- (b) 15 minutes for precision power supply tests.
- (c) 15 minutes for Fine Alignment to allow PSA to stabilize but at least 1 hour before any precision usage of PIPA's.
- Question 4. No Minimum time requirement known - in Laboratory AGC is operated as soon as Voltage current relationships are verified.
- Question 5. Block I-C, 50, 100 & Block II no minimum time requirement if cold plate temperature is within limits specified for computer operation. Clock test initiation may take place after ten (10) minutes of operation.


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*With
check schedule
w. n.t. existing
ground install
& checkout.*

IMU and AGC Warmup Time

Some confusion exists as to the required warmup times for the IMU and AGC when going from off to standby and from standby to operate. The required times need to be redefined for ground installation and checkout and for inflight operation. Answers to the following questions should clarify the warmup time requirements. The answers should reflect separate system requirements, if a difference exists. (Block I; Series C, 50, 100; Block II; Series 0.)

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1. Before placing the IMU in operate, after initial installation of the IMU in the SC, what is the minimum time for the IMU to be operating in standby, SC IMU heater power on. (Assume the AGC has been on for more than two hours.)
2. Before placing the IMU in operate, what is the minimum time for the AGC to be ON:
 - a. AGC off initially?
 - b. AGC in standby initially? (Assume the IMU heater power has been on for more than two hours.)
3. What is the required warmup period for the IMU after going to operate before:
 - a. Performing any test in which gyro and/or PIPA parameters are measured, and in any test in which precision amplitude and frequency power supply checks are made?
 - b. Performing IMU fine alignment during a normal mission.
4. When switching the AGC from standby to operate, how much warmup time is required before the AGC may be operated?
5. Is the AGC warmup time still two hours when switching from off to operate for ground checkout and pad operations? If not, what are the requirements?

*Hickey
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Data Book Info request.

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