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COLOSSUS Memo # 267

TO: Distribution
FROM: P. Rye
DATE: 28 April, 1970
SUBJECT: Revisions 29 through 36 of ARTEMIS

Revision 36 was GOOD.

The following major changes were incorporated into these revisions:

1. The setting of EBANK in STARTSUB was changed to use EBANK3 instead of the constant STARTEB and the constant was deleted. (ACB A4)

2. Extensive coding was added for Rate-aided optics: (PCR 869, PCR 987):

2.1 Entries were added to the V37 tables for P24.

2.2 Three new flags were defined. P24FLAG (Bit 14, Flag 9) is set by P24 and cleared in V37. P24MKFLG (Bit 3, Flag 2) is cleared in the initialization of P24 and set in MARKRUPT when a mark is taken during P24. NEWLMFLG (Bit 14, Flag 8) is cleared in the initialization of P24 and set in R52 when new landmark coordinates are computed.

2.3 Four unshared single precision erasables were defined: TRATE, SRATE, TOLD, and SOLD. These are zeroed in Fresh Start and in V37; TOLD and SOLD are zeroed in GOPROG. In addition, the erasables RATETEMP, NO. PASS, PASSCNT, AOPOLD, and PACTEMP were defined in unswitched erasable, and TRTEMP and SRTEMP were defined in EBANK 5.

2.4 P24 coding was created which initializes PASSCNT, sets P24FLAG, clears P24MKFLG, NEWLMFLG, ORBWFLAG, RNDVZFLG, and RENWDFLG and initializes the mark downlink area to zero. Restart group 2 is initialized and group 4 terminated. The program then updates the state vector to present time, displays V06N89, and calls R52.

2.5 Logic was added in R52 to compute landmark coordinates and shaft and trunnion rates if P24 is running. The cycle delay time for R52 was changed from .5 to .05 seconds for P24. The time increment used for predicting LOS was changed from 2.4 sec. to 1.9 sec. for P24. Operation of R52 for other users is unchanged.

2.6 Coding was added in MARKRUPT to accept and store for downlink all marks made during P24.

2.7 The Mark Reject routine was modified to accept mark rejects during P24 and to complement the time associated with the rejected mark.

2.8 The T4RUPT cycle was changed so that OPTTEST is performed every 240 ms. rather than every 480 ms. T4RUPT logic was added to disenable the optics error counters if OPTIND is negative. In manual, TVC enable bit is set and optics error counters are enabled. T4RUPT performs rate drive whenever the optics are in manual, using the erasables SRATE and TRATE. These erasables are zero at all times except during P24, thus insuring that rate drive is effective only during this time.

2.9 The disenabling of the optics error counters by S40.6 was deleted since this is automatically accomplished in T4RUPT.

2.10 A check was added to restrict V41N91 to POO since it is undesirable to perform optics coarse align during other programs.

2.11 In R53 a major mode check was added after the return from SXTMARK so that the routine exits immediately if P24 is the current program.

2.12 The P22 downlist was changed so that mark data is picked up as a snap-shot, ensuring consistent data for each mark.

3. A section of V79 coding was moved from Bank 43 to Bank 42; the subroutine ROTATE was moved from Bank 05 to Bank 06; and the subroutines LOCSAM and CHKSDATA were moved from Bank 14 to Bank 16.

4. The erasable UPSUM, formerly defined as DP, was redefined to be 3 words long. UPSUM + 2 is used in ground testing procedures. (PCR 991.1)

5. All downlists except Powered Flight were changed so that words 64 and 65 now contain OPTION1, OPTION2, and TET instead of AK's and RCSFLAGS. The subset CMPOWE06 was changed to include OPTION1, OPTION2, and TET in order to accomplish this with minimum coding impact. (PCR 921, PCR 295).

6. A modification to the Gyro Torquing Routine was made so that pulse torquing will always finish with negative polarity pulses. (PCR 970.1)

7. R64 was changed so that the rotation about YCDU will be independent of XCDU. A new erasable, MNSNTHDX, was defined in EBANK 6 which is used as temporary storage for R64. (PCR 867).

8. Code in V37, TVCEXEC, and P40 which checked Bit 13 of Channel 11 (SPS engine on bit) was changed to check ENGONFLG instead, so that failure of the engine-on discrete will not affect software logic. Code was added in the IMUCAGE routine to insure consistency of ENGONFLG and the engine state by clearing ENGONFLG when Bit 13 of Channel 11 is cleared. (PCR 995).

9. Coding was changed in the RCS Autopilot to allow MIN IMP firing by the RHC. (PCR 289).

10. Changes were made in P23 to allow an automatic maneuver for star acquisition along the track axis in R57 and to allow a choice of VECPOINT or a 3-axis maneuver to acquire landmark or horizon.

A new display is provided in R57 (V50N25FL, R1 = 15). A PROCEED response to this will initiate an automatic maneuver (R60) after displaying V01N70FL for star identification. An ENTER response will bypass both the N70 display and the maneuver and flash V59 for the calibration mark.

For landmark or horizon acquisition in P23, a PROCEED response to V50N25FL (R1 = 202) generates a 3-axis solution (shaft angle = 180^{o}) for the R60 maneuver; an ENTER response generates a VECPOINT solution.

A calculation of horizon bias was added to determine bias as a linear

function of range. This uses a newly defined, double precision, pad-loaded erasable, HORISLP. (PCR 868)

11. C13STALL routine was implemented to delay writing into channel 13 during a VHF radar read during P20 and thus prevent the "split radar pulse problem" from occurring. (ACB 111)

    a) RADTIME and RADDEL are 2 erasables that were defined to implement the above ACB.

    b) Calls to C13STALL were added to the following places: ERROR routine in Pinball, ZEROJET routine in RCS-CSM DAP, JETSLECT routine and T6 program and channel setup routine in Jet Selection Logic, DODOWNTM routine and WOZERO routine in Down-Telemetry Program.

12. Stable Orbit Rendezvous programs P38, P39, P78, and P79 were deleted. (PCR 985)

    a) Noun 57 used exclusively in Stable Orbit Rendezvous was made a spare and Assembly & Operations Information log section was updated to relfect its deletion.

    b) P39/79SW flag and bit were deleted (Bit 9 FLAG 8). OPTNSW and bit were deleted (BIT 7 FLAG 2).

13. Coding was added to reset TIMRFLAG in the subroutine CLUPDATE and thus cause the current CLOKTASK to terminate on the recycle option of the V16N45 targetting program display (COM 37).

14. The initial TVCEXEC delay was changed from .5 sec. to .51 secs. to reduce loss of downlist information. (PCR 1020)

15. The following software changes were implemented to make use of the newly added hardware module, channel 77:

    a) Downlink lists were modified to replace CADRFLSH +1 with channel 77.

    b) Coding was added to Fresh Start (V36E) to zero channel 77.

c) Coding was added to P27 to zero channel 77 after a state vector uplink only. (PCR 302.1, PCR 315.1)

16. A check for negative or zero Δt was added to the LONGCALL routine to ensure that a LONGCALL with $\Delta t \leq 0$ will result in a 21204 POODOO abort. (COM 34)

17. A new log section P15 was added to accomodate the newly added program P15 (astronaut initialization of Saturn SIVB Injection Sequence Start). Two new restart entries were added in conjunction with the addition of this program: 3.2SPOT and 3.15SPOT. The Coast and Align down-list is sent during P15. (PCR 973)

18. Code to clear STATEFLG was added to the INTEXIT section to avoid the possibility of exiting from an integration call with this flag still set. (COM36)

19. A change was made in the integration code to set X2 to the contents of PBODY in the case of origin change so that proper scaling will be used in the storing of RN, VN for downlink. (COM35)

20. RCS FRESHDAP was modified to reduce execution time. (ACB 113)

21. A change was made in MARKRUPT logic so that the V51 display is not called redundantly after every mark. Instead, a check is made on whether the desired no. of marks has been taken; the routine exits unless marking is finished, in which case the V50N25 display is called. (ACB 47)

22. The entrance GODSP in the Display Interface Routines had been deleted because it was unused. This entrance is now needed by P15 and therefore was restored. (PCR 973)

23. 5 lines of superfluous code in P40 were deleted as part of the implementation of ACB 50.

The following items should be examined for inclusion in the GSOP sections indicated:

Section 1 Items (4, 6)

Section 2 Items (2, 5, 8, 10, 11, 12, 15, 17)

Section 3 Items (7, 9, 14)

Section 4 Items (2, 7, 10, 12, 15, 17)

Section 5 Items (2, 10, 12)