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COLOSSUS Memo #62

To: Distribution
From: M. Hamilton
Date: 3 June 1968
Subject: COLOSSUS Revisions 209 and 210

Revision 210 was BAD with 5 cusses.

Major Changes Incorporated into Revisions 209 and 210

- 1) An error was fixed in the SERVICER moon calculations. The address of RTX2 was erroneously checked instead of the contents.
- 2) The accuracy of the MU calculations was improved in SERVICER.
- 3) P00 integration didn't set PHSPRDT2. This caused problems for any restart during this time. This bug was fixed.
- 4) The program description was restored for NEWPHASE.
- 5) A fix was put into PRELAUNCH to knock down the DRIFTFLG.
- 6) PRELAUNCH was fixed to work when the AZIMUTH is changed.
- 7) The new W-MATRIX extended verb 67 was added. (PCR 103.1)
- 8) TIG is no longer computed before the V16N45 display in P35. The displayed TIG in the first V16N45 display will be that of TPM. This conforms more closely to the LUMINARY GSOP.
- 9) The VHF range flag is now reset in P20-initialization instead of R22. (PCN 159)
- 10) The ENDSAFE logic was removed from the UPDATE program. Now there is no limit on updating erasables.
- 11) A routine CLEARMRK was added to FIXED-FIXED to zero EXTVBACT and set Bit 1 of FLAGWRD4. This will release extended verbs and mark displays. Coding which previously cleared EXTVBACT was changed to TC CLEARMRK.

- 12) PCR 130 was added to allow switching of the coordinate center in backward integration through the sphere.
- 13) A change was added to integration to ensure that Encke deviation overflow is detected.
- 14) A correction was made to integration to prevent possible overflow during J22 acceleration computation.
- 15) Some coding and comments were changed to help clarify sections of the DOWN TELEMETRY program.
- 16) The TVC MASSPROP was changed to comply with PCR 123 to account for the special case of LEM (ascent stage only) docked with the CSM.
- 17) The extended verb displays of R63 were changed to normal displays since R63 eventually does R60 with normal displays. This corrects the problem of locking out the normal displays.
- 18) The erroneous call to INITVEL was corrected in P17.
- 19) A correction was made in R36 to double unitize the vectors for the ARCCOS routine. This prevents the ARCCOS ABORT on too small values.
- 20) Previously a CLEANDSP was called just before the V51 display in SXTMARK for the purpose of cleaning out a leftover normal display. However P03 comes to SXTMARK with an active MARK flashing display and the CLEANDSP goes to sleep holding up SXTMARK forever. The CLEANDSP call was changed to KLEENEX in order that it would clear out the mark display as well as the leftovers from the last normal display.
- 21) A change was put into V37 to set the EBANK to 6 before the call to SETMINDB and SETMAXDB since these routines store into erasables in EBANK6 and V37 is in EBANK2. This will cure the problem of V37 clobbering the Z component of the state vector.
- 22) END-E7 was moved down to where it belongs. This will cure the EDIT problems for variables in EBANK7 which were located after the incorrect END-E7.
- 23) RELDELV and MAGVTPI in TPI must be equal to DELVTPI and DELVTPI in the P30s (used by displays) but they were moved apart in the last big erasable shuffle. This problem was fixed by exchanging the TPI erasables with other TPI erasables.
- 24) Some INITVEL was moved to share with R22 and not to share with the TPI in the W-MATRIX.
- 25) A new erasable TTE1 was added for a counter in ENTRY.
- 26) RM in the SXTMARK downlink storage was conflicting with a return erasable in P20, Q611. This conflict was fixed by moving Q611 down by one.

- 27) P37 storage was sharing with reentry storage but both programs use common display registers for N60. These conflicts were resolved by making the noun erasables unsharable with either program.
- 28) The erasable conflict due to common sharing between T3TOT4 in TPI and P(T1) in P37 was resolved by exchanging TPI erasables with each other.
- 29) The incorrect setting of Bit 2 in RASFLAG was deleted from V83.
- 30) The Display routines were changed to make non flash R routines into NOVACS instead of FINDVACS. This will save an additional VAC during P20 when R60 is going.
- 31) INTWAKE0 was fixed to go directly to INTWAKE1. This will prevent the erroneous setting up of Group 2 when the update is in Group 6.
- 32) P37 erasables VPRED and GAMMAEI were moved to prevent conflict with X(TI) and T12 in REENTRY storage but used by P37 (display nouns).
- 33) A fix was made to R53 to cause the PROCEED response on the VB53 display to only redisplay without doing SXTMARK over again.
- 34) A change was made to ENTRY to correct TTE for time lost while the crew reads and responds to the V06N60 display (TTE is displayed in N63).
- 35) Optional verification was fixed in order that a recycle is possible. This change will correct the wrong values for shaft and sextant angles during gyro compassing in N92.

Known Problems in Revision 210

- 1) E2 in TPI SEARCH conflicts with DEL in VECPOINT.
- ✓2) AVGEN sets the restart point for R22 back to 2.7 instead of 2.13. This causes funny results in a V37 following a burn.
- ✓3) R22 periodically goes to CONTCHK which checks for the TRACKFLG and at times sets group 2 for restarts at PRIORITY 26. This causes a V37 selection of a tracking program to lose R22 forever since V37 turns off the TRACKFLG and R22 restarted at PRIO26 wouldn't give the tracking program a chance to set the TRACKFLG before R22 checked for it.
- ✓4) P38 uses DSPTEM 1's for N34 at the same time P20 uses DSPTEM1's for N49.
- 5) Logic is not in V44 and V45 for the surface flag.
- ✓6) VHFTIME in P20 conflicts with VVEC and R1A in CONICS.
- ✓7) POINTEX in P20 is clobbered by SAX in P50 at the time of a V37 request. This results in the return address in R22 being destroyed.
- ✓8) An erasable in MASSPROP clobbers the return erasable TVCTMP1.

- ✓9) The FLAGWRD5 integration bit setting logic for DOWNLINK should be deleted.
- 10) The comments in the erasable area should be updated.
- 11) During the V01N71 display in R56, R2 and R3 aren't blanked. However, these registers on the same display are blanked in R53 and R51.
- 12) DELAYJOB coding should be updated to go with the new DELAYLOC.
- ✓13) If P20 is selected followed by a P22 or a P23, the next program selected will restart P23 or P22 along with itself instead of P20 since P23 and P22 are in group 2.
- 14) N51 has not been hooked up to PINBALL for R05.
- 15) If the state vectors are uplinked more than 4 time steps in the future, permanent integration will not do anything until the state vectors are within 4 time steps.
- 16) RTEVGAM, PBIAS and YBIAS (10 words) are now in fixed memory but the GSOP specifies them as erasables.
- 17) MDOT is an erasable in the AGC but specified as fixed in the GSOP.
- 18) PINBALL does not wake up displays sleeping due to astronaut use on any loads. Either a change should be made to PINBALL or ASTRONAUT decks will have to be changed.
- ✓19) If a restart occurs during the maneuver in V49, an IMU ZERO will take place since the IMUSE bit is off. The vehicle could be turning at a high maneuver rate and the DAP would not be controlling it for 13 secs.
- 20) UNITW should be 4 pad loaded erasables, not 6. The coding would need to be changed to go along with this saving of erasables.
- 21) DOWNRUPTS are lost frequently during burns.
- 22) Several obsolete flag bits are in COLOSSUS. These should be deleted.
- 23) The two verb lights appear on the DSKY during UPLINK when all displays should be locked out.
- 24) The polynomial fit for T(X) in TFF should be changed to include a wider hyperbolic range.
- 25) The state of all moon flags after a FRESH START in the MOON vicinity should be looked into. Presently they are reset to indicate earth.
- 26) S11.1 has not been written for a Lunar environment. It has scaling problems now that P47 is using it.

Potential Problems in Revision 210

- 1) The target ID is not being displayed in R1 during marking in P03 (STL Run).
- 2) Most V34 responses on displays in P03 hang up with the DSKY blank and P03 in the mode register when V34 should end up at P02 (STL Run).

Program Notes

- 16) The lunar-solar ephemeris pad loaded data is only good for 2²⁶cs (approx. 14.5 days). If the flight lasts longer, new data must be loaded.

Statistical Summary for COLOSSUS 210

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|-----------------------------------|------|
| 1) Number of modification changes | 40 |
| 2) Number of cards | 600 |
| 3) Total fixed memory changes | +137 |

Versions of COLOSSUS

<u>Rev.</u>	<u>Version</u>	<u>Testing Area</u>
208	HUGHEXEC	Executive
200	BURNCOL	P40s
196	RWSCOL	DAP