

Massachusetts Institute of Technology
Instrumentation Laboratory
Cambridge, Massachusetts

COLOSSUS Memo #61

To: Distribution
From: M. Hamilton
Date: 22 May 1968
Subject: COLOSSUS Revisions 206, 207 and 208

Revision 208 was GOOD.

Major Changes Incorporated into Revisions 206, 207 and 208

- 1) The coding which resets the PFRATFLG was deleted from V37 since P52 needed this flag to be carried over from P40.
- 2) Only bits 14 and 7 of RASFLAG are reset in GOPROG2 now instead of the whole word since RASFLAG is set equal to FLGWRD10.
- 3) FLGWRD10 is now initialized in the SWINIT logic in FRESH START.
- 4) The ENTRY DOWNLINK lists were updated to conform to the changes in ENTRY erasables.
- 5) A change was put into SATSTKON (in V46) to zero the jets and leave the T6 clock disabled (PCN 155).
- 6) Two missing INHINTS were added in P20 to the setting and resetting of the tracker light bit in DSPTAB +11D.
- 7) A correction was made in R61 to reset the 3-AXIS flag before calling R60.
- 8) Since R57 uses MARK displays it cleared EXTVBACT at the end to release normal displays. However, this was not enough since FLAGWRD4, Bit 1 (set by any mark display) also locks out normal displays. Therefore a fix was made to R57 to call ENDEXT as a NOVAC. ENDEXT will reset this bit.
- 9) A change was put into the AUGER-KUGL ENTRY angle calculations to prevent possible overflow.

- 10) A change was put into NODAPUP to zero the jets and leave the T6 clock disabled (PCN 155).
- 11) A change was added to TERM52 to reset the XDSPFLAG. This will allow the GOTOPOOH normal display to come up after the mark displays are cleared out.
- 12) A word of fixed-fixed was saved in WAITLIST.
- 13) The terminate response to the V51 display in SXTMARK now goes to TERM52 instead of GOTOPOOH. TERM52 frees the mark system before going to GOTOPOOH.
- 14) Four lines of fixed were saved in the display routines.
- 15) The check for the same MM was deleted from NEWMODEX since a re-display of the same MM is better than using 4 extra lines of fixed-fixed.
- 16) The order of RM and MARKDOWN was reversed to conform to the DOWNLINK list.
- 17) The E MATRIX was moved to occupy the last 42 registers of the W MATRIX.
- 18) An INHINT was added to MR. KLEAN since the ABORT routines do a MR. KLEAN and need to be INHINTED at this point.
- 19) Restart points 4.10 and 4.12 were changed to 4.2 and 4.4 in order to fill in unused restart spots.
- 20) R21MARK is now reset in GOPROG2. This change is necessary since a restart in V37 would clean out R21 but leave this bit set. Until R21MARK is reset all marking will go through R21 logic.
- 21) P17, S34/35.2, P31, P40 prethrust and S40.9 were changed to call the revised INITVEL (see change #31).
- 22) AVERAGE G was corrected to tests RTX2 instead of CMOONFLG to determine the sphere of influence. A change was made to MIDTOAV2 to store contents of X2 and X1 from integration into RTX2 and RTX1.
- 23) NEWPHASE was deleted from the common subroutine SKIPPER and added to KOOLADE in order that LUMINARY could save on fixed-fixed.
- 24) A NEWPHASE phase change was deleted from the UPDATE program since LUMINARY no longer uses NEWPHASE.
- 25) The erasable AXIS and the initializing of AXIS from SERVICER were deleted since AXIS is not used in the CM.
- 26) The UPDATFLG is checked after the VHF data is read in P20 in order to prevent mark incorporation if tracking programs are using erasables shared with R22.

- 27) Changes went into R22 to only zero out a 6 X 6 W MATRIX instead of a 9 X 9 W MATRIX. This change allows for an additional 54 erasables during any time other than P22.
- 28) A correction was made to R22 to raise the PRIORITY to 26 via a PRIOCHNG. Without this fix R22 would run at a PRIORITY of 10 after a restart or V37 and this would allow tracking programs (at PRIORITY 13) to interrupt R22 and conflict with R22 erasables.
- 29) A change was made in S22 to change the scaling of the computation of the third partition of the W-Matrix for an unknown landmark.
- 30) A change was made in S22 to allow for large angles (70-75 degrees) between the line of sight vector and the normal to the earth at the landmark.
- 31) INITVEL was changed to receive RTX1 and RTX2 as inputs instead of X1 and B29FLAG.
- 32) P23 program comments were updated.
- 33) ASP's are now stored all at once in the DOWNLINK registers instead of one by one in P65. A new temporary erasable ASPS(TM) was added for this change.
- 34) ENTRY DAP erasables were rearranged in order to get XPIPBUF, YPIPBUF and ZPIPBUF on the DOWNLIST. They now share with the RCS DAP DOWNLIST slots.
- 35) A change was put into P65 to replace the flashing display if it is still active when either P66 or P67 is entered.
- 36) The unused pad load erasables, TLS, LSLAT and LSALT were deleted. LSLONG was moved from unsharable erasable to share with extended verb storage.
- 37) A new DELAYLOC was added in order that 4 DELAYJOBS could be running simultaneously.
- 38) RASFLAG was moved to share with FLGWRD10.
- 39) THETA(1) was moved to prevent conflict with another V82 erasable RONE.
- 40) AMEMORY was deleted. This saves 1 erasable.
- 41) A significant change was made to the erasables in E7 which was possible because of change no. 27 above. 26 of the tracking erasables known to be illegally sharing with R22 were moved to the W-MATRIX along with the 28 R52 erasables at the end of E7. The remaining 10 tracking erasables which had conflict with R22 were moved to take up room left by R52. S40.9 and S40.2, 3 erasables (17 registers) were moved to share with R22.
- 42) R35 erasable storage was moved to share with extended verbs.

- 43) STARSAV1 and STARSAV2 were moved to the W-MATRIX to prevent the conflict with BVECTOR in measurement incorp during P23.
- 44) A fix was put into P35 to recompute a new TIG on the PROCEED response to the V16N45 display.
- 45) The initialization of ECSTEER was moved up to the beginning of P37.
- 46) The rate estimator in the ENTRY DAP was changed to agree with the GSOP.

Known Problems in Revision 208

- 1) 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.
- 2) DELAYJOB coding should be updated to go with the new DELAYLOC.
- 3) V37 which is in EBANK2 does a SETMINDB and a SETMAXDB which store in EBANK6 erasables. The result is the clobbering of RN +4 during V37.
- 4) SXTMARK does a CLEANDSP instead of a KLEENEX. If P03 calls SXTMARK at the time a MARK flashing display is on, the CLEANDSP goes to sleep and the marking V51 never comes up.
- 5) V89 and V49 do mark displays followed by normal displays in R60 without releasing the mark display system.
- 6) 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.
- 7) R56 uses mark displays without totally releasing the mark displays before going back to the normal routine.
- 8) N51 has not been hooked up to PINBALL for R05.
- 9) For some reason V83 is setting BIT2 of RASFLAG. First of all BIT2 is not checked by anyone and secondly V83 shouldn't be touching RASFLAG since extended verbs are not restartable.
- 10) 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.
- 11) RTEVGAM, PBIAS and YBIAS (10 words) are now in fixed memory but the GSOP specifies them as erasables.

- 12) MDOT is an erasable in the AGC but specified as fixed in the GSOP.
- 13) 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.
- 14) 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.
- 15) UNITW should be 4 pad loaded erasables, not 6. The coding would need to be changed to go along with this saving of erasables.
- 16) DOWNRUPTS are lost frequently during burns.
- 17) Several obsolete flag bits are in COLOSSUS. These should be deleted.
- 18) The two verb lights appear on the DSKY during UPLINK when all displays should be locked out.
- 19) The polynomial fit for T(X) in TFF should be changed to include a wider hyperbolic range.
- 20) V46 for a non SATURN DAP should clear Bit 9 of Channel 12 to prevent garbage from going into the SATURN error counters.
- 21) 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.
- 22) S11.1 has not been written for a Lunar environment. It has scaling problems now that P47 is using it.

Potential Problems in Revision 208

- 1) In P03 XDC, YDC and ZDC are conflicting with XNB, YNB and ZNB (STL).
- 2) P22-23 erasables should not share with CONICS.
- 3) Some concern exists over the assumed "safeness" of the present setup of R61 and R52 erasable overlays used during RENDEZVOUS.
- 4) If P20 is selected and the VHFRFLAG is set by V87 to turn on VHF marking it is now necessary to wait for the first mark in P20 (1 min) before selecting a new V37 program since R22 will reset the VHFRFLAG if no marks have been taken.
- 5) The target ID is not being displayed in R1 during marking in P03 (STL Run).
- 6) N92 has the wrong values for shaft and sextant angles during gyro compassing (STL Run).
- 7) 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).

Contemplated Changes in Future Revisions

- 1) All references to FLAGUP and FLAGDOWN will be deleted. UPFLAG and DOWNFLAG will be used instead.
- 2) Create a verb or extended verb to blank the DSKY.

Statistical Summary for COLOSSUS 208

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|-----------------------------------|-----|
| 1) Number of modification changes | 56 |
| 2) Number of cards | 460 |
| 3) Total fixed memory changes | -2 |

Versions of COLOSSUS

<u>Rev.</u>	<u>Version</u>	<u>Testing Area</u>
202	HUGHEXEC	Executive
200	BURNCOL	P40s
196	RWSCOL	DAP
186	MOLASSES	P40s
186	ZELOSSUS	Lambert
168	JALOSSUS	DAP
190	MARRIAGE	Erasables

Correction: The following changes went into Revision 205.

- 1) ROLLDAP was made into a TASK to cut down the number of CORE SETS during CLOCKJOB. The TASK is called every 30 ms to save on interrupt time whereas the JOB was called every 10 ms.
- 2) Several EBANK = END-E6 and EBANK = END-E7 in the P40s were changed to equal variables within the coding.
- 3) The QUICTRIG calculations were moved from ROLLDAP to CLOCKJOB in order that ROLLDAP could be a task.