

LAKSON

FROM

LUMINARY 1A (099 REV. 1)

APOLLO 11

TO

LUMINARY 1B (116)

APOLLO 12

TO

LUMINARY 1C (131)

APOLLO 13



M.I.T. INSTRUMENTATION LABORATORY • Cambridge, Massachusetts • 22537-1 • 12/69

SUMMARY OF LUMINARY 1B DEVELOPMENT

Establishment of a LUMINARY 1B Assembly	2 June 1969
Release of LUMINARY 1B (Rev. 116) for Rope Manufacture	12 August 1969
Completion of Mission "H" Level 6 Testing	15 October 1969
Total Number of PCR/PCNs Accomplished in the LUMINARY 1B (Rev. 116) Release	40
Total Number of Anomalies Fixed in the LUMINARY 1B (Rev. 116) Release	25



LUMINARY 1B PCR/PCNs IMPLEMENTED

- 277 Affixed DUMPCNT.
- 279 Variable Insertion Computation.
- 284 VGTIGs on C/A Downlist.
- 773.2 Fix Constants for Planetary Inertial Subroutine. *LMY 55*
- 776.2 Improved R2 Model Timing. *25% time saving*
- 779 Leave Track Enable Set when R29 is Terminated.
- 780 Provide Pure RR Range, Range Rate and Time Lag during P20, P22, and P25. *N⁷⁸*
- 781.2 PIPA Bias Compensation Scale. *XXX.XX NN
XXXX.X FPS
TFI XXBXX MS*
- 791.2 Do Not Allow a PROCEED Response to V21, V22 or V23.
- 798.2 Reset GLOKFAIL in R00.
- 801.2 Make BAILOUT Alarms Start with 3XXXX and POODOO Alarms with 2XXXX.
- 802.2 Save Alarm Data after "Error Rest".
- 805 Don't Allow V66 on the Surface. *CM 3U = LMSU*
- 807.2 Add Present Time to P21.
- 812.2 Resetting and Setting of the External V Flag. *EXIT BEFORE FINAL COMP*



LUMINARY 1B PCR/PCNs IMPLEMENTED (Cont)

- 814 (Rev.) Reduce Keystrokes Required to Check and Approve LR Data.
- 816 ~~817~~ **MODIFY R03 TO PERMIT SETTING 1° DEADBAND**
- 817 ~~817~~ Eliminate Undesirable LR Position Alarms from R12. (LNY80) **511 + 522**
PUT V63E V34E AFTER LR POWER ON INCORRECTLY
- 818 Permit Rejection of Individual Measurement Incorporations in P20.
- 820 Eliminate Lighting of ALT Light when Low Scale Discrete is Absent.
- 823 Delete P31 from LUMINARY 1B.
- 825.2 Display Option 3 in P52/P54.
- 826.2 Reverse P76 Display.
- 827 Add ZDOTD to Ascent-Descent Downlist. **Due to vari ins byt P70,71**
- 830 Supplementary ASTEER Modification. **Required to make Lambert work under certain circumstances**
- 831.2 Lambert Overflow Protection.
- 832.2 Define Actual Restrictions on Running R05. **Don't Limit to P00**
- 838 Prevent RCS Jet on Lunar Surface (LNY 82). **P68 SETS TO MAX DB V37 RESTORES**
PRO ON V06 N60 TO ZERO
DAP ERRORS 6/7/82
- 839 R12 and LR Repositioning Routines Improvements. **delete 50,000 ft check**
REPAIRS LNY 12/82
- 840 Reduce Oscillation in P64/P65. (LNY 79) **523 ALARM PRO, ENTR**
~ set .3° DB
- 841 PGNCS Derived Vehicle Attitude Rate on FDAI Error Needle. **R60 always sets**
MODE 2 needles



LUMINARY IB PCR/PCNs IMPLEMENTED (Cont)

- 842 Modification of Criteria Used to Determine DAP Phase Plan Parabola Intercept. (LNY 78) **DEVELOPE SMALL LIMIT CYCLES ABOUT WHENEVER DISTURBING ACCELERATION LIES**
- 844 Deletion of P38/P78 and P39/P79. **in DRY REGION .30/sec² - .70/sec²**
- 845 Do Not Turn on R29 during P70/P71. (~~CSOP~~ change only) **ROOM m**
- 847 Eliminate Possible Lockout of Pitchover from P12, P70 and P71. **EXECUTION TIME NEEDED BY VARI INS TGT**
- 848 Prevent RR ECDU's from Stealing LGC Memory Cycles. **REMOVE 5° ATT ERROR (YAW) LOCKOUT - APOLLO II.**
- 853 Restrict V35 to P00. **DISABLES PIPS**
- 854 Provide a Flexible Method for Crew to Modify RLS. **N 69**
- 855 Begin Reading LR Velocity as soon as Velocity Data Good Appears.
- 856 Change 1502/1206 from POODOO's to BAILOUTS.
- Provide CH13STAL Coding. (By G Low Direction) **- SPLIT PULSE**



ANOMALIES FIXED IN LUMINARY 1B

- 55 Errors in Fixed Constants (PCR 773.2) ERROR IN MAC GENERATION
 58 RDRUSECK Bug R76. 1210 WHEN R12 IS RUNNING WITH R76
 61 Restart Protection P20 and P22. SHAFT FOR TRUN UPDATE IN ERROR & PG
 62 P70 and P71 Select 1⁰ Deadband. LATE P70 SO V97 RESPONSE SETS
 63 P40 Recycle. P ENGINE FAIL TO IGNITE OR BEFORE 26 SEC
 64 Restart in P63. 12 TO 26 SEC LGL WOULD FAIL TO FTP - CREW
 66 R04 Erasable Conflict with R65. ERASABLE OVERLAY WORK AROUND
 67 Make ATTSTALL 1210 into BAILOUT Instead of POODOO. IF TWO PROB CALL
 68 P57 IMU Compensation Conflict. WITH P57 GYRO TORQUE - REED P57
 69 Coding Error, Downward Jet Firing. .05 lbs of fuel
 71 P22 Lunar Surface Navigation. NOT AFFECTED. Extended VERBS GIVE WRONG ANS
 72 511 Alarm after V32E. TO 523 RR PRE-DESIG STORES INDS ERAS USED
 73 Correct Location of V06N61. V32 RESPONSE TO 06 G1 PASSED CONTROL
 74 Erasable Conflict. P57 SUN, EARTH, MOON TO ENGINE FAIL ROUTINE - RESELE
 76 Wrong Erasable in Pinball. P66 R3 ALT UPDATED ONLY 2 SEC CT P63
 78 Non-zero Attitude Errors near Orbit Insertion (PCR 842)
 DAP LIMIT CYCLE DIST ACCEL



ANOMALIES FIXED IN LUMINARY 1B (Cont)

79 Crossplane Vertical Oscillations during P64/P65. (PCR 840)

DAP DB OVERSHOOT
10° sway LAND MANUALLY

80 V63E with LR Power Off Causes Improper RADMODES BIT 6 (PCR 817)

81 Erasables Shared between Radar Tasks and Jobs.

VHIN72 conflict with OTHER RR ROUTINES

82 Max DB only when P68 Running (PCR 838).

PRO TO ZERO DAP

87 Coding Error in P22. GSCP CONFLICT

88 Landing Radar Repositioning Routine is Not Restart Protected.

HOWR
caused V2/N1
3427E 37777E, V25 N7E 107E,
3000E OE
APOLLO II V96 TO STOP

89 Backwards Integration can Occur in P27.

90 V97N63 Display Overwritten by V06N63 Display.

1 SEC

2 SEC

DO AGAIN FOR FAIL FROM

91 CDU Fail Program Alarm in P20 When Not an Alarm Condition

TIG TO FTP

P20 MANUALLY LOCK ON - DON'T DO

PLEASE FILE IN

TP#

DATE



ANOMALIES REMAINING IN LUMINARY 1B

DRAWING LINE WEIGHT - ARTIST'S DISCRETION

- LNY 12 V06 Flashing during V97 NXX.
- LNY 31 Use of V30 and 3L.
- LNY 75 Radar Self Test Routine. **69499 SAMPLE RR TWICE RATHER THAN GO TO LR**
- LNY 92 V41 and V42 do not Perform CCS NEWJOB before Final Display. **KEY ALSE REQUIRED TO BRING UP CYCLIC DISPLAY**
- L-1B-01 Selection of P22 Before CSM is within RR Coverage. **530 ALARM display**
- L-1B-02 R29 Will Not Achieve RR Lock-On. **P12 DON'T USE WORK AROUND INCORRECT SHAFT COMP**
- L-1B-03 Quantity Coeffr. Discrepancy when IVACCQ and 1JACCR are equal. **LOSE Z AXIS CONTROL**
- L-1B-04 During Descent Switching RR Mode into LGC and Out Disables Meter. **X- POINTER VEL LOST**
- L-1B-05 R60 Mode II Attitude Errors Placed in FDAI Needles Before Desired Attitude. **NEEDLES JUMP**
- L-1B-09 Restart during R12 ~~Restart~~ **NEXT RR READ** May be Incorrect. **4400 FT WORST CASE**
- L-1B-10 Rate and Attitude Overshoot After ACA is Returned to Detent. **MAY ENTER ATT HOLD**
- L-1B-11 Terminal Mass Error. **RATHER THAN DAMP RATES FIRST**
250 lbs INACCURATE MASS COMPUTATION IN SERVICER

PLEASE FILL IN

TP# DATE



SUMMARY OF LUMINARY IC DEVELOPMENT

DRAWING LINE WEIGHT - ARTIST'S DISCRETION

ESTABLISHMENT OF A LUMINARY IC ASSEMBLY.- 8-15-69. 8-15-69

RELEASE OF LUMINARY IC (REVISION 130) FOR ROPE
MANUFACTURE. 11-5-69

RE-RELEASE OF LUMINARY IC (REVISION 131) FOR
ROPE MANUFACTURE. 12-3-69

TOTAL NUMBER OF PCN/PCR'S ACCOMPLISHED
IN THE LUMINARY IC ASSEMBLY. 12

TOTAL NUMBER OF ANOMALIES FIXED IN THE
LUMINARY IC ASSEMBLY. 10



LUMINARY IC PCN/PCR's IMPLEMENTED

- 285 Remove check of auto throttle discrete. **DELETE P67**
- 806.2 Allow N07 to address output channels. **ADD N92 GTC**
GND TESTING
H
H
- 846 (Rev. 1) More accurate DELTA-T TAIL-OFF for P70.
- 863.2 P76 set NODO flag. **RUIN CM SV IF V37 TOO SOON**
- 882 Replace VHORIZ with something better. **± FORWARD XXXX.X FPS**
- 893 Abort Flagbit. **→ LNY 131 J₁ K₁ VS J₂ K₂ .5571/bit**
- 895 V59E allow use of LR in position #2 in P63. **ENABLE DURING AVE.C**
- 936.2 Initialize V90 time to TIG. **CREW WON'T HAVE TO LOAD**
- 943 Velocity reasonability test. **7.5 FPS TO ERASABLE**
- 968 LPD Bias. **VALUES IN ERASABLE** **AZ ECADR**
EL 1773
1365
- 971 Change fixed memory constant (APS) DELTA-T TAIL-OFF.
- 972 Display polarity of sighting angle difference in R-54. **NOS**
± 00001

ACB MARK X Y REJECT
ROD P66 LOCKOUT



ANOMALIES FIXED IN LUMINARY IC

DRAWING LINE WEIGHT - ARTIST'S DISCRETION

- LN Y 75 Radar Self Test Routine.
- LN Y 92 V41 and V42 do not Perform CCS NEWJOB Before Final Display.
- L-1B-01 Selection of P22 Before CSM is Within RR Coverage.
- L-1B-02 R29 will not Achieve RR Lock-on.
- L-1B-03 Quantity Coeffr Discrepancy when IVACCQ and 1JACCR are Equal.
- L-1B-04 During Descent Switching RR Mode into LGC and Out Disables Meter.
- L-1B-05 R60 Mode II Attitude Errors Placed in FDAI Needles Before Desired Attitude.
- L-1B-09 Restart During R12 ~~Restart~~ ^{RR READ} May be Incorrect.
- L-1B-10 Rate and Attitude Overshoot After ACA is Returned to Detent.
- L-1C-02 For Early Aborts from PDI, Locations of a VAC Area are Destroyed. **LN Y 131**



ANOMALIES REMAINING IN LUMINARY 1C

L-1B-11 Terminal Mass Error.

L-1C-01 Delta V May be Subtracted Twice from V_G Following a Restart. PHO - 001

L-1C-03 If a V59E is Used to Reposition the LR Antenna to Position Z at Anytime Other Than Powered Descent in P63, The Return From Repositioning Will Be Incorrect.

DON'T USE V59 OTHER THAN DURING POWERED DESCENT

DATE - SAME SIZE AS TITLE

TP# - SIZE REQ'D TO MATCH PREPRINTED TP#

PLEASE FILL IN

TP# DATE

