MIT

G.L. Silver

BIKII/LM

G. SILVER

MIT/LL

BIK 11/LM

BACK

LGC DWO Link
WO 121-125 in POMO

AURORA 88 VERB/NOUN CODES

VERBS

01	DISPLAY OCTAL COMP 1
02	DISPLAY OCTAL COMP 2
03	DISPLAY OCTAL COMP 3
04	DISPLAY OCTAL COMP 1, 2
05	DISPLAY OCTAL COMP 1,2,3
06	DECIMAL DISPLAY
07	DP DECIMAL DISPLAY
10	ILLEGAL
11	MONITOR OCT COMP 1
12	MONITOR OCT COMP 2
13	MONITOR OCT COMP 3
14	MONITOR OCT COMP 1 2
15	MONITOR OCT COMP 1 2, 3
16	MONITOR DECIMAL
17	MONITOR DP DECIMAL
20	ILLEGAL
21	LOAD COMP 1
22	LOAD COMP 2
23	LOAD COMP 3
24	LOAD COMP 1, 2
25	LOAD COMP 1, 2, 3
26	ILLEGAL
27	FIXED MEMORY DISPLAY
30	REQUEST EXECUTIVE
31	REQUEST WAITLIST
32	C(R2) INTO R3, C(R1) INTO R2
33	PROCEED WITHOUT DATA
34	TERMINATE
35	TEST LIGHTS
36	FRESH START
37	CHANGE MAJOR MODE
40	ZERO
41	COARSE ALIGN
42	FINE ALIGN IMU
43	LOAD IMU ATTITUDE ERROR METERS
44	ILLEGAL
45	COMMAND LR TO POSITION 2
46	SAMPLE RADAR ONCE PER SEC
47	PERFORM LEM FCS TEST
50	PLEASE PERFORM
51	PLEASE MARK
52	PLEASE MARK Y
53	PLEASE MARK X OR Y
54	PULSE TORQUE GYROS
55	ALIGN TIME
56	PERFORM BANKSUM
57	PERFORM SYSTEM TEST
60	ILLEGAL
61	ILLEGAL
62	SCAN LEM INBITS
63	INITIALIZE AGS
64	ILLEGAL
65	ILLEGAL
66	LOTS FRESH START
67	ILLEGAL
70	ACQUIRE WITH LOTS
71	LOTS SELF TEST
72	RETURN LOTS TO STOW
73	ILLEGAL
74	ILLEGAL
75	ILLEGAL
76	ILLEGAL
77	ILLEGAL

NOUNS

01	SPECIFY ADDRESS (FRACTIONAL)
02	SPECIFY ADDRESS (WHOLE)
03	SPECIFY ADDRESS (DECREES)
04	SPECIFY ADDRESS (HOURS)
05	SPECIFY ADDRESS (SECONDS)
06	SPECIFY ADDRESS (GYRO DEGREES)
07	SPARE
10	CHANNEL TO BE SPECIFIED
11	SPARE
12	SPARE
13	SPARE
14	SPARE
15	INCREMENT ADDRESS
16	TIME SECONDS
17	TIME HOURS
20	ICDU
21	PIPAS
22	NEW ANGLES 1
23	DELTA ANGLES 1
24	DELTA TIME (SECONDS)
25	CHECKLIST
26	PRIO/DELAY, ADRES, BBCON
27	SELF TEST ON/OFF SWITCH
30	STAR NUMBERS
31	FAILREG, SFAIL ERCOUNT
32	DECISION TIME (MIDCOURSE)
33	EPHEMERIS TIME (MIDCOURSE)
34	MEASURED QUANTITY (MIDCOURSE)
35	INBIT MESSAGE
36	LANDMARK DATA 1
37	LANDMARK DATA 2
40	RR ANGLES (TRUNNION, SHAFT)
41	NEW RR ANGLES (TRUNNION SHAFT)
42	AOT ROTATION ANGLES
43	AOT DETENT CODE
44	FORWARD VELOCITY, LATERAL VELOCITY
45	ROTATIONAL HAND CONTROLLER ANGLE RA
46	SPARE
47	SPARE
50	SPARE
51	SPARE
52	GYRO BIAS DRIFT
53	GYRO INPUT AXIS ACCELERATION DRIFT
54	GYRO SPIN AXIS ACCELERATION DRIFT
55	LR ALTITUDE TIME
56	LR VELX, TIME
57	LR VELY TIME
60	LR VELZ, TIME
61	TARGET AZIMUTH AND ELEVATION
62	RR RANGE TRUNNION SHAFT
63	RR RANGE RATE TRUNNION, SHAFT
64	INITIAL ALT , FINAL ALT , ALT RATE
65	SAMPLED TIME (HOURS AND SECONDS)
66	SYSTEM TEST RESULTS
67	DELTA GYRO ANGLES
70	LOTS ANGLES (AZIMUTH ELEVATION)
71	DESIRED LOTS ANGLES (AZIMUTH, ELEVATIO
72	DELTA POSITION
73	DELTA VELOCITY
74	MEASUREMENT DATA (MIDCOURSE)
75	MEASUREMENT DEVIATIONS (MIDCOURSE)
76	POSITION VECTOR
77	VELOCITY VECTOR

1 AUGUST 1966

AC ELECTRONICS

Silver

AURORA 88 ERROR CODES

OPTICS SUBSYSTEM

00105	MARK BUTTONS NOT AVAILABLE
00111	MARK IS MISSING AFTER ENTER
00112	MARK NOT BEING ACCEPTED
00113	NO INBITS
00114	MARK MADE BUT NOT DESIRED
00115	X MARK NOT MADE

IMU SUBSYSTEM

00206	ZERO CDU NOT ALLOWED WITH COARSE ALIGN AND GIMBAL LOCK
00207	ISS TURN ON REQUEST NOT PRESENT FOR 90 SECONDS
00210	IMU NOT OPERATING
00211	COARSE ALIGN ERROR
00212	PIPA FAIL BUT PIPA IS NOT BEING USED
00213	IMU NOT OPERATING WITH TURN-ON REQUEST
00214	PROGRAM USING IMU WHEN TURNED OFF

PROCEDURAL DIFFICULTY

00401	DESIRED GIMBAL ANGLES YIELD GIMBAL LOCK
00402	STAR OUT OF FIELD OF VIEW
00403	STAR OUT OF FIELD OF VIEW

RADAR ERRORS

00501	RADAR ANTENNA OUT OF LIMITS
00502	BAD RADAR GIMBAL ANGLE INPUTS
00503	RADAR ANTENNA DESIGNATE FAIL
00510	RADAR AUTO DISCRETE NOT PRESENT
00514	RADAR GOES OUT OF AUTO MODE WHILE BEING USED
00520	NO RADAR RUPT EXPECTED
00521	RADAR DATA COULD NOT BE READ
00522	WRONG LR POSITION
00523	LR ANTENNA DID NOT MAKE IT
00524	BAD RADAR TARGET

COMPUTER HARDWARE MALFUNCTIONS

01102	AGC SELF TEST ERROR
01103	UNUSED CCS BRANCH EXECUTED ABORT
01105	DOWNLINK TOO FAST
01106	UPLINK TOO FAST
01107	(SHOWN IN R2) PHASE TABLE DISAGREEMENT IN RESTART

LIST OVERFLOWS (ALL ABORTS)

01201	EXECUTIVE OVERFLOW-NO VAC AREAS
01202	EXECUTIVE OVERFLOW-NO CORE SETS
01203	WAITLIST OVERFLOW-TOO MANY TASKS
01206	KEYBOARD AND DISPLAY WAITING LINE OVERFLOW
01207	NO VAC AREA FOR MARKS
01210	TWO PROGRAMS USING DEVICE AT SAME TIME

INTERPRETER ERRORS

01301	ARCSIN-ARCCOS INPUT ANGLE TOO LARGE ABORT
01302	SQRT CALLED WITH NEGATIVE ARGUMENT ABORT

DISPLAY ALARMS

01400	PITCH AND/OR ROLL TRIM FAIL IS ON (WITH V05 N25)
01410	TEMPORARY JET FAIL
01411	A) OPCHK- IMU IS NOT ON- IN IMU OPERATIONAL CHECK. B) ERRMASK CDU DOES NOT AGREE WITH COMMAND IN IMU OPCHECK C) STILLOOK FIRST CDU PULSE WAS MISSED IN IRIG SF TEST D) STOPTEST- LAST CDU PULSE WAS MISSED OR GYRO TORQUE LOOP OUT OF LIMITS IN IRIG SF TEST.

KEYBOARD AND DISPLAY PROGRAM

01501	KEYBOARD AND DISPLAY ALARM DURING INTERNAL USE (NVSUB) ABORT

SYSTEM TEST ALARMS

01600	DRIFT TEST MISSED IN TIME STEP
01601	DRIFT TEST INTEGRATION OVERFLOW
01602	DRIFT TEST ERROR IN GYRO TORQUING

1 AUGUST 1966

Prepared By: O.H. Cerbins

AC ELECTRONICS

SUNDIAL C VERB/NOUN CODES

VERBS		NOUNS	
01	DISPLAY OCTAL COMP 1	01	SPECIFY ADDRESS (FRACTIONAL)
02	DISPLAY OCTAL COMP 2	02	SPECIFY ADDRESS (WHOLE)
03	DISPLAY OCTAL COMP 3	03	SPECIFY ADDRESS (DEGREES)
04	DISPLAY OCTAL COMP 1, 2	04	SPECIFY ADDRESS (HOURS)
05	DISPLAY OCTAL COMP 1, 2, 3	05	SPECIFY ADDRESS (SECONDS)
06	DECIMAL DISPLAY	06	SPECIFY ADDRESS (GYRO DEGREES)
07	DP DECIMAL DISPLAY	07	SPECIFY ADDRESS (T OPT DEGREES)
10	ILLEGAL	10	CHANNEL TO BE SPECIFIED
11	MONITOR OCT COMP 1	11	SPARE
12	MONITOR OCT COMP 2	12	SPARE
13	MONITOR OCT COMP 3	13	SPARE
14	MONITOR OCT COMP 1, 2	14	SPARE
15	MONITOR OCT COMP 1, 2, 3	15	INCREMENT ADDRESS
16	MONITOR DECIMAL	16	TIME SECONDS
17	MONITOR DP DECIMAL	17	TIME HOURS
20	ILLEGAL	20	IGDU
21	LOAD COMP 1	21	PIPA
22	LOAD COMP 2	22	NEW ANGLES 1
23	LOAD COMP 3	23	DELTA ANGLES 1
24	LOAD COMP 1, 2	24	DELTA TIME (SECONDS)
25	LOAD COMP 1, 2, 3	25	CHECKLIST
26	ILLEGAL	26	PRIO/DELAY, ADRES, BBCON
27	FIXED MEMORY DISPLAY	27	SELF CHECK ON/OFF SWITCH
30	REQUEST EXECUTIVE	30	STAR NUMBERS
31	REQUEST WAITLIST	31	FAILREG, SFAIL, ERCOUNT
32	c(R2) INTO R3, c(R1) INTO R2	32	DECISION TIME (MIDCOURSE)
33	PROCEED WITHOUT DATA	33	EPHEMERIS TIME (MIDCOURSE)
34	TERMINATE	34	MEASURED QUANTITY (MIDCOURSE)
35	TEST LIGHTS	35	INBIT MESSAGE
36	FRESH START	36	LANDMARK DATA 1
37	CHANGE MAJOR MODE	37	LANDMARK DATA 2
40	ZERO	40	SPARE
41	COARSE ALIGN	41	SPARE
42	FINE ALIGN IMU	42	SPARE
43	LOAD IMU ATTITUDE ERROR METERS	43	SPARE
44	ILLEGAL	44	SPARE
45	ILLEGAL	45	SPARE
46	ILLEGAL	46	SPARE
47	PERFORM CSM & SATURN TESTS	47	SPARE
50	PLEASE PERFORM	50	SPARE
51	PLEASE MARK	51	SPARE
52	PERFORM PRELAUNCH ALIGNMENT OPTICAL VERIFICATION	52	GYRO NBD
53	ILLEGAL	53	GYRO ADIA
54	PULSE TORQUE GYROS	54	GYRO ADSRA
55	ALIGN TIME	55	OCDU
56	PERFORM BANKSUM	56	UNCALLED MARK (OPTX, OPTY, TIME)
57	PERFORM SYSTEM TEST	57	NEW OCDU ANGLES
60	PREPARE FOR CGC STANDBY	60	DELTA GYRO ANGLES FOR PRELAUNCH OPTICAL VERIFICATION
61	RECOVER FROM CGC STANDBY	61	TARGET AZIMUTH AND ELEVATION
62	SCAN CSM INBITS	62	IGDUZ AND TIME
63	ILLEGAL	63	OCDUS AND TIME
64	ILLEGAL	64	OCDUT AND TIME
65	ILLEGAL	65	SAMPLED TIME (HOURS & SECONDS)
66	ILLEGAL	66	SYSTEM TEST RESULTS
67	ILLEGAL	67	DELTA GYRO ANGLES
70	ILLEGAL	7D	PIPA BIAS
71	ILLEGAL	71	PIPA SCALE FACTOR ERROR
72	ILLEGAL	72	DELTA POSITION
73	ILLEGAL	73	DELTA VELOCITY
74	ILLEGAL	74	MEASUREMENT DATA (MIDCOURSE)
75	ILLEGAL	75	MEASUREMENT DEVIATIONS (MIDCOURSE)
76	ILLEGAL	76	POSITION VECTOR
77	ILLEGAL	77	VELOCITY VECTOR

Prepared by O.H. Cerbins

AC ELECTRONICS

SUNDIAL C ERROR CODES

OPTICS SUB-SYSTEM

00105	MARK BUTTON NOT AVAILABLE
00110	NO MARK SINCE LAST MARK REJECT
00112	MARK NOT BEING ACCEPTED
00113	NO INBITS
00114	MARK MADE BUT NOT DESIRED
00115	OPTICS TORQUE REQUEST WITH SWITCH NOT AT CGC
00116	OPTICS SWITCH ALTERED BEFORE 15 SEC, ZERO TIME ELAPSED
00117	OPTICS TORQUE REQUEST WITH OPTICS NOT AVAILABLE (OPTIND = -0)
00120	OPTICS TORQUE REQUEST WITH OPTICS NOT ZEROED

IMU SUB-SYSTEM

00207	ISS TURN-ON REQUEST NOT PRESENT FOR 90 SEC
00210	IMU NOT OPERATING
00211	COARSE ALIGN ERROR
00212	PIPA FAIL BUT PIPA IS NOT BEING USED
00213	IMU NOT OPERATING WITH TURN-ON REQUEST
00214	PROGRAM USING IMU WHEN TURNED OFF

PROCEDURAL DIFFICULTY

00401	DESIRED GIMBAL ANGLES YIELD GIMBAL LOCK
00402	STAR OUT OF FIELD OF NEW
00403	STAR OUT OF FIELD OF NEW

COMPUTER HARDWARE MALFUNCTIONS

01102	AGC SELF CHECK ERROR
01103	UNUSED CCS BRANCH EXECUTED. ABORT
01105	DOWNLINK TOO FAST
01106	UPLINK TOO FAST
01107	PHASE TABLE DISAGREEMENT. DOFSTART

UST OVERFLOWS (ALL ABORTS)

01201	EXECUTIVE OVERFLOW - NO VAC AREAS
01202	EXECUTIVE OVERFLOW - NO CORE SETS
01203	WAITLIST OVERFLOW - TOO MANY TASKS
01206	KEYBOARD AND DISPLAY WAITING LINE OVERFLOW
01207	NO VAC AREA FOR MARKS
01210	TWO PROGRAMS USING SAME DEVICE AT SAME TIME

INTERPRETER ERRORS

01301	ARCSIN-ARCCOS INPUT ANGLE TOO LARGE ABORT
01302	SQRT CALLED WITH NEGATIVE ARGUMENT. ABORT

DISPLAY ALARMS

01401	TESTIDX TOO LARGE IN CSM & SATURN TEST. ENDTEST
01402	AN ILLEGAL QUANTITY LOADED IN THE JET OR ENGINE TASK ERASABLE TABLE. ENDTEST
01403	AN ILLEGAL QUANTITY LOADED IN THE SPS OR SATURN STEERING TASK ERASABLE TABLE. ENDTEST
01404	CSM & SATURN TEST PLEASE PERFORM TASK 401, 402, OR 403 FAILED. ENDTEST
01405	ICDUS BUSY DURING SATURN STEERING TEST ENDTEST
01411	A) OPCHK. IMU IS NOT ON, IN IMU OPERATIONAL CHECK. B) ERRMASK CDU DOES NOT AGREE WITH COMMAND IN IMU OP CHECK C) STILLOK. FIRST CDU PULSE WAS MISSED IN IRIG SF TEST. D) STOPTEST. LAST CDU PULSE WAS MISSED OR CYRO TORQUE LOOP OUT OF LIMITS IN IRIG SF TEST

KEYBOARD AND DISPLAY PROGRAM

01501	KEYBOARD AND DISPLAY ALARM DURING INTERNAL USE (NVSUB). ABORT

SYSTEM TEST ALARMS

01600	DRIFT TEST MISSED IN TIME STEP
01601	DRIFT TEST INTEGRATION OVERFLOW
01602	DRIFT TEST ERROR IN CYRO TORQUING. ENDTEST

BLOCK II BASIC INSTRUCTIONS

INSTRUCTION	ORDER CODE	DESCRIPTION
AD K	06.	ADD K
ADS E	02 6	ADD TO STORAGE E
AUG E	12. 4	AUGMENT E
BZF F	11 2 11. 4 11. 6	BRANCH ON ZERO TO FIXED F
BZMF F	16 2 16. 4 16. 6	BRANCH ON ZERO OR MINUS TO FIXED F
CA K CAE E CAF F	03 03 03.	CLEAR AND ADD K CLEAR AND ADD E CLEAR AND ADD F
CCS E	01.0	DOUNT, COMPARE, AND SKIP ON E
DOM	04 0000	COMPLEMENT A
CS K	04.	CLEAR AND SUBTRACT K
CYL	.0022	CYCLE LEFT
CYR	.0020	CYCLE RIGHT
DAS E	02.0	DOUBLE ADD TO STORAGE E
DCA K	13.	DOUBLE CLEAR AND ADD K
DCS K	14.	DOUBLE CLEAR AND SUBTRACT K
DCOM	14 0000	DP COMPLEMENT
DDOUBL	02 0000	DP DOUBLE
DIM E	12. 6	DIMINISH E
DOUBLE	06. 0000	DOUBLE A
DTCB	05. 2005	DP TRANSFER DONTROL BOTH BANKS
DV E	11.0	DIVIDE BY E
DXCH E	05. 2	DOUBLE EXCHANGE A AND E
EDOP	.0023	EDIT OPERATOR
EXTEND	0..0006	EXTEND
INCR E	02. 4	INCREMENT E
INDEX E	05. 0	INDEX NEXT BASIC INSTRUCTION WITH E
INDEX K	15.	INDEX NEXT EXTRA CODE INSTRUCTION WITH K
INHINT	00. 0004	INHIBIT INTERRUPT

INSTRUCTION	ORDER CODE	DESCRIPTION
LXCH E	02.2	EXCHANGE L AND E
MASK K	07.	MASK WITH K
MP K	17.	MULTIPLY K
MSK K	07.	MASK K
MSU E	12 0	MODULAR SUBTRACT E
NDX E	05. 0	INDEX E
NDX K	15.	INDEX K
NOOP	03. 0000	NO OPERATION (E)
NOOP	TCF H+1	NO OPERATION (F)
OVSK	05. 4000	OVERFLOW SKIP TS A
QXCH E	12. 2	EXCHANGE Q AND E
RAND H	10. 2	READ AND "AND" H
READ H	10 0	READ H
RELINT	00 0003	RELEASE INHIBIT INTERRUPT
RESUME	05 0017	RESUME INTERRUPTED PROGRAM
RETURN	00 0002	RETURN, TCQ
ROR H	10. 4	READ AND "OR" H
RXOR H	10. 6	READ AND EXCLUSIVE 'OR' H
SR	.0021	SHIFT RIGHT
SU E	16. 0	SUBTRACT E
TCAA	05. 4005	TRANSFER CONTROL TO ADDRESS IN A TS Z
TC K	00.	TRANSFER CONTROL TO K
TCF F	01. 2 01. 4 01. 6	TRANSFER DONTROL TO FIXED F
TCR K	00.	TC K
TS E	05. 4	TRANSFER TO STORAGE E
WAND H	10. 3	WRITE AND "AND" H
WOR H	10. 5	WRITE AND 'OR" H
WRITE H	10. 1	WRITE H
XCH E	05. 6	EXCHANGE A AND E
ZL	02. 2007	ZERO L, LXCH ZERO
ZQ	12. 2007	ZERO Q; QXCH ZERO

SILVER

CHANNEL ASSIGNMENTS LEM

CHANNEL	NAME	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	CHANNEL
1	L	CP REGISTER L, BITS 16-1															1
2	Q	CP REGISTER Q, BITS 16-1															2
3	SCALER2		HIGH - ORDER SCALER CHANNEL, BITS 14-1														3
4	SCALER1		LOW - ORDER SCALER CHANNEL, BITS 14-1														4
5	PITCH YAW								14 RCS 1D	13 RCS 1U	10 RCS 2D	9 RCS 2U	6 RCS 3D	5 RCS 3U	2 RCS 4D	1 RCS 4U	5
6	ROLL								16 RCS 1S	4 RCS 4S	8 RCS 3S	12 RCS 2S	11 RCS 2I	15 RCS 1I	3 RCS 4I	7 RCS 3I	6
7	TEXT									L7	L6	L5					7
10	DSKY R	RELAY ADRS 4	RELAY ADRS 3	RELAY ADRS 2	RELAY ADRS 1	RELAY BIT 11	RELAY BIT 10	RELAY BIT 9	RELAY BIT 8	RELAY BIT 7	RELAY BIT 6	RELAY BIT 5	RELAY BIT 4	RELAY BIT 3	RELAY BIT 2	RELAY BIT 1	10
11	DSKY A		ENGINE OFF	ENGINE ON			CAUTION RESET	TEST CONNEC		OP ERROR	VN FLASH	KEY RLSE	TEMP CAUTION	UPLINK ACTV	COMP ACT	ISS WARN	11
12	GN&C	ISS T ON DEL COMP	RR ENAB AUTO TR	LR POS COMM	ROLL TRIM	-ROLL TRIM	PITCH TRIM	+PITCH TRIM	DISPLAY I DATA		ENABL IMU ERR	ZERO ICDU	COARS ALIGN	LR VEL LO SCL	ENABL RR ERR	ZERO RRCDU	12
13	AGC	ENABL 16 RUPT	RESET TRAP 32	RESET TRAP 31B	RESET TRAP 31A	ENABL STANDBY	TEST ALARMS	RHC READ	ENABL RHC CTR	DNLNK WD ORD	BLOCK INLINK	INHIBIT UPLINK	RADAR ACT	RADAR a	RADAR b	RADAR c	13
14	IMU	DRIVE CDUX	DRIVE CDUY	DRIVE CDUZ	DRIVE OCDUT	DRIVE OCDUS	GYRO ACT	GYRO MINUS	GYRO a	GYRO [illegible]	GYRO ENABL		THRUST DRIVE	ALT METER	ALT RATE	OUTLINK ACTV	14
15	MAIN DSKY											KEY 5M	KEY 4M	KEY 3M	KEY 2M	KEY 1M	15
16	NAV DSKY									DESCENT -	DESCENT +	MARK REJECT	MARK Y	MARK X			16
30	GN&C	TEMP IN LIM	ISS T ON REQUEST	IMU FAIL	ICDU FAIL	IMU CAGE	G N CONT OF S C	IMU OPRAT		RRCDU FAIL	DISPLAY I DATA	AUTO THROTL	ABORT STAGE	ENGINE ARMED	STAGE VERIFY	ABORT	30
31	TRANS ROT	ALT CONT OUT OF D	AUTO STAB	ATT HOLD	-Z TRANS	+Z TRANS	Y TRANS	+Y TRANS	X TRANS	+X TRANS	AZ (LPD) -RMI	+AZ (LPD) +RMI	-YMI	+YMI	EL (LPD) PMI	+EL (LPD) +PMI	31
32	IMPULSE						X ROLL GIMB OFF	X PITCH GIMB OFF	T 10 11 FAIL	T 9-12 FAIL	T 13 15 FAIL	T 14 16 FAIL	T 6-7 FAIL	T 1 3 FAIL	T 5 8 FAIL	T 2 4 FAIL	32
33	OPTICS AGC	OSC ALARM	AGC WARNING	PIPA FAIL	DNLNK TOO FAST	UPLNK TOO FAST	BLOCK UPLNK	LR RANG LO SCL	LR VEL DAT GOOD	LR POS 2	LR POS 1	LR DATA GOOD	RR DATA GOOD	RR RANG LO SCL	RR PWR ON AUTO		33
34	DNLNK1																34
35	DNLNK2																35
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	

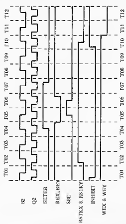
Bit positions

XLM1 SETS BIT FOR EITHER GIMBAL FAIL

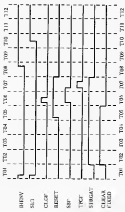
X SET BY TRIM GIMBAL ON - OFF SWITCH ON LM 1

Silver

BLOCK II ERASABLE MEMORY TIMING DIAGRAM



BLOCK II ROPE MEMORY TIMING DIAGRAM



CHANNEL ASSIGNMENTS CM

CHANNEL	NAME	BIT POSITIONS 15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	CHANNEL
1	L	CP REGISTER L, BITS 16-1															1
2	Q	CP REGISTER Q, BITS 16-1															2
3	SCALER2	HIGH ORDER SCALER CHANNEL, BITS 14-1															3
4	SCALER1	LOW ORDER SCALER CHANNEL, BITS 14-1															4
5	PITCH YAW								#6 +YW-X+P	#7 +YW-X-P	#8 -YW-X+P	#5 +YW-X+P	#2 PIPZR	#3 +P-X-YW	#4 -PIPZ-R	#1 +P-X+YW	5
6	ROLL													#11 +R-Y-Z	#12 -R-Y-Z	#9 +R+Y+Z	6
7	TEXT										EG	EG					7
10	DSKY R	RELAY ADRS 4	RELAY ADRS 3	RELAY ADRS 2	RELAY ADRS 1	RELAY BIT 11	RELAY BIT 10	RELAY BIT 9	RELAY BIT 8	RELAY BIT 7	RELAY BIT 6	RELAY BIT 5	RELAY BIT 4	RELAY BIT 3	RELAY BIT 2	RELAY BIT 1	10
11	DSKY A	ISS T ON DEL COMP	STVB CUTOFF	ENGINE ON			CAUTION RESET	TEST CONNEC		OP ERROR	VN FLASH	KEY RLSE	ZERO ICDU	11MP CAUTION	UPLINK ACTV	COMP ACT	11
12	CN&C	ENABL T6 RUPT	RESET TRAP 32	STVB INJ SEQ	DISENG O/T DAC	ENABL STANDBY	ZERO OPTICS	SIVB TAK OVR	1VC ENABLE		ENABL IMU ERR	INHIBIT UPLINK	COARS ALIGN	STAR TRACK	ENABL OPT ERR	ZERO OCDU	12
13	AGC	TEMP IN LEM	ISS T ON REQUEST	IMU FAIL	ICDU FAIL	IMU CAGE	S/C CONT OF SAT	IMU OPRAT	BMAG CTR ENB	DNLNK WD GRD	BLOCK INLINK	LIFT OFF	SIVB SEPRAT	SPS READY	SM SEPRAT	ULLAGE THRUST	13
14	IMU	DRIVE CDUX	DRIVE CDUY	DRIVE CDUZ	DRIVE OCDUT	DRIVE OCDUS	GYRO ACT	GYRO MINUS	GYRO a	GYRO b	GYRO ENABL					OUTLINK ACTY	14
15	MAIN DSKY											KEY 5M	KEY 4M	KEY 3M	KEY 2M	KEY 1M	15
16	NAV DSKY									MARK REJECT	MARK	KEY 6N	KEY 4N	KEY 3N	KEY 2N	KEY 1N	16
30	GN&C	TEMP IN LEM	ISS T ON REQUEST	IMU FAIL	ICDU FAIL	IMU CAGE	S/C CONT OF SAT	IMU OPRAT		OCDU TAIL	GUID REF RFL	LIFT OFF	SIVB SEPRAT	SPS READY	SM SEPRAT	ULLAGE THRUST	30
31	TRANS RQT	G/G AUTO PILOT	FREE FUNC	HOLD FUNC	+Z TRANS	+Z TRANS	+Y TRANS	+Y TRANS	-X TRANS	-X TRANS	ROLL MAN ROT	+ROLL MAN ROT	YAW MAN ROT	+YAW MAN ROT	-PITCH MAN ROT	+PITCH MAN ROT	31
32	IMPULSE				LEM ATTCHD						ROLL MIN IMP	+ROLL MIN IMP	-YAW MIN IMP	+YAW MIN IMP	PITCH MIN IMP	+PITCH MIN IMP	32
33	OPTICS AGC	OSC ALARM	AGC WARNING	PIPA FAIL	DNLNK TOO FAST	UPLNK TOO FAST	BLOCK UPLINK			STAR TRKS	STAR TRACK	AGC CONTRL	ZERO OPTICS				33
34	DNLNK1	16 BITS															34
35	DNLNK2	16 BITS															35
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	

1 JUNE 1966

AC ELECTRONICS

OUTPUT CHANNEL 05

PITCH AND YAW RCS

BIT POSITION	CHANNEL OUTPUT SIGNAL	S/M	C/M	LEM
1	RC + X + P	#1 RCS + X + P	#1 RCS + P - X + YW	#1 RCS 4U
2	RC - X - P	#4 RCS - X - P	#4 RCS - P + Z - R	#2 RCS 4D
3	RC - X + P	#3 RCS - X + P	#3 RCS + P - X - YW	#5 RCS 3U
4	RC + X - P	#2 RCS + X - P	#2 RCS - P + Z + R	#6 RCS 3D
5	RC + X + Y	#5 RCS + X + YW	#5 RCS +YW - X + P	#9 RCS 2U
6	RC - X - Y	#8 RCS - X - YW	#8 RCS - YW - X - P	#10 RCS 2D
7	RC - X + Y	#7 RCS - X + YW	#7 RCS +YW - X - P	#13 RCS 1U
8	RC + X - Y	#6 RCS + X -YW	#6 RCS - YW - X + P	#14 RCS 1D

OUTPUT CHANNEL 06

ROLL RCS

811 POSITION	CHANNEL OUTPUT SIGNAL	S/M	C/M	LEM
1	RC + Z + R	#9 RCS + Z + R	#9 RCS + R + Y +Z	#7 RCS 3F
2	RC - Z - R	#12 RCS - Z - R	#12 RCS - R - Y - Z	#3 RCS 4F
3	RC - Z + R	#11 RCS - Z + R	#11 RCS + R + Y - Z	#15 RCS 1F
4	RC + Z -R	#10 RCS + Z - R	#10 RCS - R - Y +Z	#11 RCS 2F
5	RC + Y + R	#13 RCS + Y + R		#12 RCS 2S
6	RC - Y - R	#16 RCS - Y - R		#8 RCS 3S
7	RC - Y + R	#15 RCS - Y + R		#4 RCS 4S
8	RC + Y - R	#14 RCS + Y - R		#16 RCS 1S

OUTPUT CHANNEL 10

DSKY B RELAYS

BIT POSITION	CHANNEL OUTPUT SIGNAL	CM	LEM
1	RLYB01	RELAY BIT 1	*Same as CM
2	RLYB02	RELAY BIT 2	"
3	RLYB03	RELAY BIT 3	"
4	RLYB04	RELAY BIT 4	"
5	RLYB05	RELAY BIT 5	"
6	RLYB06	RELAY BIT 6	"
7	RLYB07	RELAY BIT 7	"
8	RLYB08	RELAY BIT 8	"
9	RLYB09	RELAY BIT 9	"
10	RLYB010	RELAY BIT 10	"
11	RLYB011	RELAY BIT 11	"
12	RYWD12	RELAY ADDRESS 1	"
13	RYWD13	RELAY ADDRESS 2	"
14	RYWD14	RELAY ADDRESS 3	"
15/16	RYWD16	RELAY ADDRESS 4	"

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AC ELECTRONICS

SLUGH

OUTPUT CHANNEL 11

DSKY A RELAYS

BIT POSITION	CHANNEL OUTPUT SIGNAL	CM	LEM
1	ISSWAR	ISS WARNING	*SAME AS CM
2	COMACT	LIGHT COMPUTER ACTIVITY LAMP	*
3	UPLACT	LIGHT UPLINK ACTIVITY LAMP	*
4	TMPOUT	LIGHT TEMP CAUTION LAMP	*
5	KYRLS	LIGHT KEY RELEASE LAMP FLASH	*
6	VNFLSH	FLASH VERB AND NOUN LAMPS	*
7	OPEROR	LIGHT OPERATOR ERROR LAMP (FL)	*
8	OT1108		
9	OT1109	TEST CONNECTOR OUTBIT	*
10	OT1110	CAUTION RESET	*
11	OT1111		
12	OT1112		
13	OT1113	ENGINE ON/OFF	ENGINE ON
14	OT1114		ENGINE OFF
15/16	OT1116		

OUTPUT CHANNEL 12

GN & C

BIT POSITION	CHANNEL OUTPUT SIGNAL	CM	LEM
1	ZOPCDU	ZERO OPTICS CDU	ZERO RR CDU
2	ENEROP	ENABLE OPTICS ERR CTR	ENABLE RR ERR CTR
3	STARON	ENABLE STAR TRACKER	HORIZ VELOCITY LO SCALE
4	COARSE	COARSE ALIGN ENABLE	*SAME AS CM
5	ZIMCDU	ZERO IMU CDU's	*
6	ENERIM	ENABLE IMU ERR CTR	*
7	-	-	-
8	TVCNAB	TVC ENABLE	DISPLAY INERTIAL DATA
9	S4B1AK	ENABLE SIVB TAKE OVER	+PITCH GIMBAL TRIM
10	ZEROPT	ZERO OPTICS	-PITCH GIMBAL TRIM
11	DISDAC	DISENGAGE OPTICS DAC	+ROLL GIMBAL TRIM
12	MROLGT	-	-ROLL GIMBAL TRIM
13	S4BSEQ	SIVB INJ SEQ START	LR POS COMMAND
14	S4BOFT	SIVB CUTOFF	RR ENABLE AUTO TRACK
15	ISSTDC	ISS TURN ON DELAY COMPLETED	*

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OUTPUT CHANNEL 13

RADAR AND AGC

BIT POSITION	CM	LEM
1	RADAR MODE SELECTION c	*SAME AS CM
2	RADAR MODE SELECTION b	*
3	RADAR MODE SELECTION a	*
4	RADAR ACTIVITY	*
5	INHIBIT UPLINK ENABLE XLINK	*
6	BLOCK INLINK	*
7	DOWNLINK WORD ORDER	*
8	ENABLE BMAG COUNTER	RHC COUNTER ENABLE
9	-	START RHC READ
10	TEST ALARMS	*
11	ENABLE STANDBY	*
12	RESET TRAP 31-A	*
13	RESET TRAP 31-B	*
14	RESET TRAP 32	*
15	ENABLE 16RUPT	*

RADAR SELECTION a b c	
0 0 0	NONE
0 0 1	RR RANGE
0 1 0	RR RANGE RATE
0 1 1	NONE
1 0 0	LR X VELOCITY
1 0 1	LR Y VELOCITY
1 1 0	LR Z VELOCITY
1 1 1	LR RANGE

OUTPUT CHANNEL 14

GYRO AND CDU DRIVES

BIT POSITION	CM	LEM
1	UPLINK ACTIVITY	*SAME AS CM
2		ALTITUDE RATE SELECTION
3		ALTITUDE METER ACTIVITY
4		THRUST DRIVE
5	ENTRY VELOCITY DRIVE SPARE	MONITOR INCR DRIVE SPARE
6	GYRO ENABLE	*
7	GYRO SELECTION b	*
8	GYRO SELECTION a	*
9	GYRO SIGN MINUS	*
10	GYRO ACTIVITY	*
11	DRIVE OCDU SHAFT	*
12	DRIVE OCDU TRUNNION	*
13	DRIVE IMU CDU Z	*
14	DRIVE IMU CDU Y	*
15	DRIVE IMU CDU X	*

GYRO SELECTION a b	GYRO
0 0	NONE
0 1	DRIVE X GYRO
1 0	DRIVE Y GYRO
1 1	DRIVE Z GYRO

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INPUT CHANNEL 15

MAIN PANEL KEYBOARD

BIT POSITION	CHANNEL INPUT SIGNAL	CM	LEM	TRAP	RUPT
1	MKEY1	KEY 1M	*SAME AS CM	15	5
2	MKEY2	KEY 2M	*	15	5
3	MKEY3	KEY 3M	*	15	5
4	MKEY4	KEY 4M	*	15	5
5	MKEY5	KEY 5M	*	15	5

INPUT CHANNEL 16

NAVIGATION PANEL KEYBOARD

BIT POSITION	CHANNEL INPUT SIGNAL	CM	LEM	TRAP	RUPT
1	NKEY1	KEY1	-	16A	6
2	NKEY2	KEY2	-	16A	6
3	NKEY3	KEY3	MARK X	16A	6
4	NKEY4	KEY4	MARK Y	16A	6
5	NKEY5	KEY5	MARK REJECT	16A	6
6	MARK	MARK	DESCENT +	16B	6
7	*MRKREJ	MARK REJECT	DESCENT -	16B	6

INPUT CHANNEL 30 (INVERTED LOGIC)

GN & C

BIT POSITION	CHANNEL INPUT SIGNAL	CM	LEM
1	ULLTHR	ULLAGE THRUST PRESENT	ABORT
2	SMSEPR	SM SEPARATE	STAGE VERIFICATION
3	SPSRDY	SPS READY	ENGINE ARMED
4	S4BSAB	S4B SEPARATE, ABORT	ABORT STAGE
5	LFTOFF	LIFT OFF S4B	AUTO THROTTLE
6	GUIREL	GUIDANCE REF RELEASE	DISPLAY INERTIAL DATA
7	OPCDFL	OPTICS CDU FAIL	RR CDU FAIL
8	IN3008		
9	IMUOPR	IMU OPERATE	*SAME AS CM
10	CTLSAT	S/C CONTROL OF SAT	G&N CONTROL OF S/C
11	IMUCAG	IMU CAGE	*
12	CDUFAL	IMU CDU FAIL	*
13	IMUFAL	IMU FAIL	*
14	ISSTOR	ISS TURN ON REQUEST	*
15	TEMPIN	TEMP IN LIMITS	*

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INPUT CHANNEL 31 (INVERTED LOGIC)

TRANSLATION AND ROTATION

BIT POSITION	CHANNEL INPUT SIGNAL	CM	LEM
1	MANR+P	+PITCH MAN ROT	+EL (LPD), +PMI
2	MANR-P	-PITCH MAN ROT	-EL (LPD), -PMI
3	MANR+Y	+YAW MAN ROT	+YMI
4	MANR-Y	-YAW MAN ROT	-YMI
5	MANR+Z	+ROLL MAN ROT	+AZ (LPD), +RMI
6	MANR-Z	-ROLL MAN ROT	-AZ (LPD), -RMI
7	TRAN+X	+X TRANSLATION	*SAME AS CM
8	TRAN-X	-X TRANSLATION	*
9	TRAN+Y	+Y TRANSLATION	*
10	TRAN-Y	-Y TRANSLATION	*
11	TRAN+Z	+Z TRANSLATION	*
12	TRAN-Z	-Z TRANSLATION	*
13	HOLFUN	HOLD FUNCTION	ATTITUDE HOLD
14	FREFUN	FREE FUNCTION	AUTO STABILIZATION
15	GCAPCL	G/C AUTO PILOT CONTROL	ATTITUDE CONTROL OUT OF DETENT

INPUT CHANNEL 32 (INVERTED LOGIC)

IMPULSE

BIT POSITION	CHANNEL INPUT SIGNAL	CM	LEM
1	MNIM+P	+PITCH MIN IMPULSE	THRUSTER 2-4 FAIL
2	MNIM-P	-PITCH MIN IMPULSE	THRUSTER 5-8 FAIL
3	MNIM+Y	+YAW MIN IMPULSE	THRUSTER 1-3 FAIL
4	MNIM-Y	-YAW MIN IMPULSE	THRUSTER 6-7 FAIL
5	MNIM+R	+ROLL MIN IMPULSE	THRUSTER 14-16 FAIL
6	MNIM-R	-ROLL MIN IMPULSE	THRUSTER 13-15 FAIL
7	TRST9	-	THRUSTER 9-12 FAIL
8	TRST10	-	THRUSTER 10-11 FAIL
9	PCHGOF	-	PITCH GIMBAL OFF
10	ROLGOF	-	ROLL GIMBAL OFF
11	LEMATT	LEM ATTACHED	
12	IN3212		
13	IN3213		
14	IN3214		
15	IN3216		

INPUT CHANNEL 33 (INVERTED LOGIC)

OPTICS AND AGC

BIT POSITION	CHANNEL INPUT SIGNAL	CM	LEM
1			
2	RRPONA	-	RR POWER ON/AUTO
3	RRRESC	-	RR RANGE LOW SCALE
4	ZEROF	ZERO OPTICS	RR DATA GOOD
5	OPMSW2	AGC CONTROL	LR DATA GOOD
6	OPMSW3	STAR TRACKER ON	LR POSITION 1 (DESCENT)
7	STRPRS	STAR PRESENT	LR POSITION 2 (HOVER)
8	LVDAGD	-	LANDING VEL DATA GOOD
9	LRRLSC	-	LR RANGE LOW SCALE
10	BLKUPL	BLOCK UPLINK INPUT	*SAME AS CM
11	NO NAME 3	UPLINK TOO FAST	*
12	NO NAME 4	DOWNLINK TOO FAST	*
13	PIPAFL 2	PIPA FAIL	*
14	AGCWAR 2	AGC WARNING	*
15	OSCALM 2	OSCILLATOR ALARM	*

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AC ELECTRONICS

Silver