

PART II

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PART II

SAT IB EDD CONFIGURATION CONTROL PAGE LISTING, REVISION A

This Revision A constitutes a complete reprinting of this volume; pages affected by this revision are identified by the notation "Rev. A" in the lower right corner. The following Flight Program Change Requests (FPCRs) are incorporated in this revision: FPCR 206-1 thru -9; 206-D1, -D2, and -D3.

SECTION 1

AS-206 DATA AND REQUIREMENTS

1.1 INTRODUCTION

The requirements for the AS-206 Flight Program consist of the baseline defined in Part I and this section of Part II. Wherever the AS-206 program functions must differ from the baseline, the requirements of this section supersede the baseline requirements of Part I.

The AS-206 Launch Vehicle is assigned to the Skylab A mission which comprises one dual and two single launch missions. The first payload is the unmanned Skylab, designated SL-1. It is boosted into orbit by the S-IC and S-II stages of the AS-513 launch vehicle. The second payload, assigned to the AS-206 launch vehicle, is a manned Command and Service Module (CSM) designated SL-2. At the conclusion of the first mission phase, the Skylab (SL-1) is stored in orbit for the use of later revisit missions. Each of the two revisit missions consists of a single Saturn IB launch with a manned CSM. The AS-207 and AS-208 launch vehicles are assigned to the revisit missions, designated SL-3 and SL-4 respectively. Each manned CSM docks with the Skylab in orbit.

The SL-1/Skylab A will be launched northeasterly from KSC Launch Complex 39 Pad A (LC-39A) and will be inserted in a circular orbit of approximately 235 NM altitude at an inclination of 50 degrees. Prior to launching the SL-2 CSM and each subsequent CSM, the Skylab will be checked from the ground by telemetry for compliance with pre-specified launch commit criteria.

On the first day following the SL-1 launch, the SL-2 manned CSM will be launched northeasterly on a Saturn IB vehicle from KSC Launch Complex 39, Pad B (LC-39B). The CSM will be inserted into an 81 x 120 NM orbit. The Service Module (SM), Service Propulsion System (SPS), and SM Reaction Control System (RCS) will be used to complete the CSM rendezvous maneuvers and to dock axially with the Skylab at port 5 of the Multiple Docking Adapter. The crew will then transfer from the CSM and activate the Skylab.

The SL-1/SL-2 mission will be planned for a duration of up to 28 days from the launch of the SL-2 CSM. After completion of the scheduled experiments the Skylab will be prepared for orbital storage and will be left in the solar inertial attitude. The CSM will undock from the Skylab and deorbit with the SPS. Assuming planned mission duration and deorbit, recovery will occur during daylight in the West Atlantic recovery area.

The subsequent SL-2 and SL-3 Manned CSM revisit missions will also be launched northeasterly from KSC LC-39B. Assuming planned mission duration and deorbit, both recoveries will occur during daylight in the mid-Pacific recovery area.

1.2 LOGIC DIFFERENCES BETWEEN THE AS-206 MISSION AND THE
BASELINE REQUIREMENTS

As presently defined, there are no logic differences from the baseline to the AS-206 logic requirements. As new logic, unique to AS-206, is defined, it will be added to this section.

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1.3 EVENT SEQUENCING TIMELINE

The following table describes the requirements for flight program sequencing. For each timed event, the table gives:

- A definition of the event
- The time at which the event must occur
- The time base or other occurrence to which the event is referenced
- The name of the time presetting.

During boost mode, the events must occur at the times specified in the table with a minus zero, plus one boost major loop tolerance (unless a closer tolerance is defined). During orbital mode, the tolerance is minus zero, plus one second (unless a closer tolerance is defined). Events specified to occur at a time base plus zero (T_j+0) must be performed after the essential functions of starting the time base, but before any other functions except switch selector functions and minor loops.

Events that are defined with different presetting names must not be initiated by common logic, even though the times of occurrence may be the same. Common logic may be used for all events that are specified with the same presetting name.

The table contains a source code that is not a program requirement. It indicates the source and character of certain presettings and is included for convenience only. The meanings of the source codes are:

- A1 Times established by the baseline requirements (mission-independent)
- B Times established by IBM
- C2 Times established by the orbital timeline
- C3 Times established by normal boost guidance requirements
- C4 Times established by alternate mission requirements
- D1 Times established by the Flight Sequence ICD
- D3 Times established by other program requirements
- E Times established by DCS transmitted data.

TABLE 1-1 EVENT SEQUENCE TIMELINE

Time Reference	EDD Symbol	Presettings (Seconds)	Source Code	Events
T0	None	0		<p>Initialize acceleration, (F/M), to FM0</p> <p>Set backup acceleration (F/M)_c, to the negative of the computed value of G_{Sx}.</p> <p>Set the accelerometer RTCs to 3 m/sec² vertical (X), 2 m/sec² crossrange (Y) and downrange (Z).</p> <p>Enable accelerometer zero test, using sin (2°) to compute A_{c0}.</p> <p>Initialize all values of reciprocal acceleration to (M/F)₀ for use in S-IVB stage IGM.</p> <p>Reset all interrupts.</p> <p>Release Inhibit on INT9, TLC Interrupt.</p> <p>Set the number of permissible unreasonable backup resolver readings (MS15DT) to 12 per 0.8 sec. The guidance reference failure discrettes (D04 and D06) will be set on detecting 13 unreasonable backup resolver readings in 0.8 sec.</p> <p>Set the zero gimbal test constant ML6HUN to 0.06 deg (all channels).</p> <p>Set MS25DT to 25*ΔT_{N1}.</p>

TABLE I-1 EVENT SEQUENCE TIMELINE (CONTINUED)

Time Reference	EDD Symbol	Presettings (Seconds)	Source Code	Events
T0	None	0		<p>Set MS04DT to $0.04/\Delta T_{N1}$.</p> <p>Start performing tests for guidance reference failure. If that condition is detected, set D04 and D06 and the appropriate mode code bits. These tests must be performed during all phases of flight.</p> <p>Set ladder rate limits (MSK5) to 0.48 deg per minor loop, all channels.</p> <p>Set ladder magnitude limits to 15.3 deg in pitch and yaw (MSK6) and roll (MSK16).</p> <p>Set attitude command (χ) rate limits to 1.0 deg per sec. (MSLIM1=0.04 deg per minor loop in roll, MSLIM2=0.04 deg per minor loop in pitch and yaw.)</p> <p>Set the fine gimbals angle RTCs, (MLK2) and (MLK12) to 1.4 deg per minor loop in the pitch, yaw and roll channels for the initial reading only. After the initial reading, set the fine gimbals angle RTCs to 0.4 deg per minor loop in pitch and yaw (MLK2) and 0.4 deg per minor loop in roll (MLK12).</p>

TABLE 1-1 EVENT SEQUENCE TIMELINE (CONTINUED)

Time Reference	EDD Symbol	Presettings (Seconds)	Source Code	Events
T0	None	0		Set the backup gimbal angle RTC (MLKRC1) to 18.5 deg for first use in all channels. Set the backup gimbal angle RTC after first use to 0.6 deg per minor loop in pitch and yaw (MLKRC3) and 0.6 deg per minor loop in roll (MLKRC5).
T0	None	16.0 (-0,+40 ms)	D1	Start checking DI24 (Liftoff) for purpose of setting Time Base 1. This discrete must be checked before and after every minor loop (twice every 40 ms).
T0	BU2	17.5	D1	Begin search for liftoff acceleration.
T0	BU3	150.0	D1	Enter a one instruction non-interruptible loop, preventing TBI initiation, if liftoff has not been detected.
T0	TM	497.0	D1	Activate ECS Water Valve logic. The variable TM is incremented by 300 sec each time the logic is exercised.
T0	NUPTIM	Variable	E	Update position and velocity components via Navigation Update DCS command. This is a transmitted parameter and has meaning only if that command has been received and accepted.

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TABLE 1-1 EVENT SEQUENCE TIMELINE (CONTINUED)

Time Reference	EDD Symbol	Presettings (Seconds)	Source Code	Events
T1	None	0		<p>Initialize backup thrust, mass and mass flow rate to F_1, M_1, and M_{1c}, and start computing $(F/M)_c$.</p> <p>Stop looking for Liftoff Discrete, DI24.</p> <p>Start using ΔT_{N2}.</p> <p>Decrement T1 by T1BIAS if Time Base 1 was set by backup method. (T1 = T1-T1BIAS)</p>
T1	T_{S1E0}	5.8	D3	<p>Start computing acceleration (F/M) based on measured velocities, using the first guess FM0 initialized at T0+0.</p> <p>Start checking DI14 and DI15 for S-IB engine out indications. If either discrete is detected, the $\sin(6^\circ)$ will be used to compute A_{c0}, time tilt guidance will be modified, the backup time for Time Base 2 start will be modified, bit 18 of Mode Code 24 will be set, and either bit 8 (for DI15) or bit 9 (for DI14) of Mode Code 25 will be set.</p>
T1	T_{RTC}	10.0	D3	<p>Set the accelerometer RTCs to 6 m/sec^2 downrange (Z), vertical (X), and cross-range (Y).</p>

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TABLE 1-1 EVENT SEQUENCE TIMELINE (CONTINUED)

Time Reference	EDD Symbol	Presettings (Seconds)	Source Code	Events
T1	T _{f1}	5.8	C3	Change from first to second segment freeze time function for S-IB engine out.
T1	T _{f2}	40.0	C3	End of second segment of engine failure freeze time function. (This is the latest time that an engine failure will result in a chi freeze.)
T1	T _{far}	110.0	C3	Change from first segment to second segment of tilt arrest time bias function. Tilt arrest time will not be decreased for engine failures after this time.
T1	None	132.0	D1	Enable INT2 (S-IB Low Level Sensors Dry "A") and start checking DI21 (S-IB Low Level Sensors Dry "B") for initiation of Time Base 2. This is keyed to the "propellant Level Sensors Enable" switch selector command. If either signal is recognized after this time and down-range velocity is greater than 500 m/sec (bypass when GRF has occurred), Time Base 2 must be set.
T1	NTSTB2	135.5	D1	Nominal start time for Time Base 2 used in repeatable flight simulation.

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TABLE 1-1 EVENT SEQUENCE TIMELINE (CONTINUED)

Time Reference	EDD Symbol	Presettings (Seconds)	Source Code	Events
T_c	TMEFRZ	0	C3	End X_y freeze following an S-IB engine out. TMEFRZ is recalculated at the engine out time T_{EO} . ($T_c = T_{EO} - T_{I+T_d}$, where T_c is the implementation delay.)
T_c	T_{S0}	10.3	C3	Backup time for starting pitch and roll guidance (Guidance will nominally be started at tower clearance.)
T_c	T_{T2}	30.0	C4	Earliest time for chi freeze initiation if an S-IB engine failure occurs.
T_c	T_{S1}	46.3	C3	Begin using second segment Time Tilt (Pitch program) coefficients.
T_c	T_{S2}	89.05	C3	Begin using third segment Time Tilt (Pitch program) coefficients.
T_c	T_{ar}	131.05	C3	Nominal time to stop Time Tilt (Tilt Arrest). (This time can be extended by an S-IB engine out.)

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TABLE 1-1 EVENT SEQUENCE TIMELINE (CONTINUED)

Time Reference	EDD Symbol	Presettings (Seconds)	Source Code	Events
T2	None	0		<p>Stop checking DI21 and inhibit INT2 (S-IB Low Level Sense signals). If DI15 has not been previously detected, continue checking for it until detected. Do not modify accelerometer Zero test if DI15 is detected during Time Base 2.</p> <p>Continue checking for DI14. Do not modify accelerometer backups if DI14 is detected during Time Base 2.</p>
T2	None	3.1	D1	<p>Set acceleration, F/M, to the preset constant FM2. (This is keyed to the inboard engines cutoff switch selector.)</p>
T2	None	4.6	D1	<p>Adjust the S-IB accelerometer backup parameters (\dot{M}_1, F_1) to one-half their present values.</p> <p>Start checking for S-IB outboard engines cutoff signals (INT5 and DI23), initiated at propellant depletion cutoff, for the purpose of setting Time Base 3. (This is keyed to the LOX Depletion Cutoff Enable switch selector.)</p>
T2	NTSTB3	6.0	D1	<p>Nominal start time for Time Base 3 used in repeatable flight simulation.</p>

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TABLE I-1 EVENT SEQUENCE TIMELINE (CONTINUED)

Time Reference	EDD Symbol	Presettings (Seconds)	Source Code	Events
T3	None	0		<p>Reinitialize first guess at acceleration, (F/M), to FM4.</p> <p>Increase vertical and downrange accelerometer RTCs to 50 m/sec²; crossrange RTC unchanged at 6 m/sec².</p> <p>Disable accelerometer zero test.</p> <p>Reinitialize backup mass, mass flow rate and thrust to M₂, zero and F₂₁, respectively.</p> <p>End Time Tilt guidance if tilt arrest has not already occurred.</p> <p>Stop checking DI14 and DI15 for S-IB engine failures. If either discrete was detected earlier, the checking of the recognized discrete stopped at that time.</p> <p>Resume using sin (2°) to compute A_{co} and reset bit 18 of Mode Code 24, if set.</p> <p>Stop checking DI23 and inhibit INT5 (S-IB Cutoff signals).</p>
T3	BUI	0.4	D1	<p>Start checking DI22 and release inhibit on INT6 for Manual initiation of S-IVB cutoff. This time must not be less than the time of issuance of the S-IVB Engine Cutoff No. 1 Off switch selector.</p>

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TABLE I-1 EVENT SEQUENCE TIMELINE (CONTINUED)

Time Reference	EDD Symbol	Presettings (Seconds)	Source Code	Events
T3	T3 _{FMC}	6.08	C3	Start using mass flow rate, \dot{M}_2 , and backup thrust, F_2 , in computing backup acceleration, (F/M). (This is the predicted time of S-IVB 90% thrust.)
T3	None	6.08	C3	If neither INT6 nor DI22 has been recognized in this time base, enable the accelerometer zero test and decrease vertical and downrange accelerometer RTCs to 6 m/sec ² .
T3	T3 _{FM}	6.08	C3	Resume computing acceleration, (F/M), using first guess, FM4, initialized at T3+0.
T3	S4IGTM	10.0	D1	Start computing smoothed reciprocal acceleration, (M/F) _S , using first guess, (M/F) ₀ , initialized at T0+0. Release inhibit on Time Base 4 and start checking for cutoff conditions. Flight Program response to INT4 is inhibited before this time. Start checking DI5. (After this time, the presence of any two of the four S-IVB cutoff indications will initiate Time Base 4.)
T3	T3 _{IGM}	30.0	C3	Start IGM. Start using ΔT_{N3} .

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TABLE 1-1 EVENT SEQUENCE TIMELINE (CONTINUED)

Time Reference	EDD Symbol	Presettings (Seconds)	Source Code	Events
T3	T _{SMC}	58.5	C3	Enable SMC calculations.
T _{1i}	None	0.0	C3	Start computing artificial τ_3 and decrementing T _{3i} . Set T _{1i} = 0. Stop computing τ_1 and T _{1i} .
IGM Time-to-go	ϵ_2	25.0	D2	Start using mass flow rate, \dot{M}_3 , and backup thrust, F ₃ , in computation of backup acceleration, (F/M) _c . Start \tilde{X} , terminal steering guidance mode. Start using ΔT_{N4} .
IGM Time-to-go	BN ₁	14.4	B	Start building velocity history for S-IVB cutoff.
IGM Time-to-go	T _{HSL} + ΔT_b	5.0 + ΔT_b	D2	Enter IGM high speed cutoff loop when the velocity-to-be-gained is less than a velocity guard, VGRD. (If guidance reference failure has occurred, do not enter the high speed cutoff loop. If GRF occurs after entering, continue until cutoff.) Inhibit SMC calculations.

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TABLE 1-1 EVENT SEQUENCE TIMELINE (CONTINUED)

Time Reference	EDD Symbol	Presettings (Seconds)	Source Code	Events
IGM Time-to-go	$T_{HSL} + \Delta T_b$	5.0 + ΔT_b	D2	Set up S-IVB Engine Cutoff On switch selector.

TABLE 1-1 EVENT SEQUENCE TIMELINE (CONTINUED)

Time Reference	EDD Symbol	Presettings (Seconds)	Source Code	Events
T4	None	0		<p>Set acceleration, (F/M), to zero.</p> <p>Increase vertical and downrange accelerometer RTCs to 50 m/sec² (crossrange RTC unchanged at 6 m/sec²).</p> <p>Disable accelerometer zero test.</p> <p>Set backup thrust and mass flow rate to zero.</p> <p>Reset the command decoder and the DCS error counter and enable INT8.</p> <p>Enable the following DCS commands: Time Base Update, Generalized Switch Selector, Execute Generalized Maneuver, Return to Nominal Timeline, Terminate, Inhibit Water Control Valve Logic.</p> <p>Stop checking for S-IVB cutoff. (Disable INT4 and DI5.)</p> <p>Stop checking DI22 and inhibit INT6 for Manual Initiation of S-IVB cutoff.</p> <p>Start using ΔT_{N5}.</p> <p>Change the zero gimbal test constant, ML6HUN, to 1.4 deg.</p>

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TABLE I-1 EVENT SEQUENCE TIMELINE (CONTINUED)

Time Reference	EDD Symbol	Presettings (Seconds)	Source Code	Events
T4	None	0		Change attitude command rate limits in all channels. MSLIM1 = 0.024 deg per minor loop in roll (0.6 deg per sec). MSLIM2 = 0.016 deg per minor loop in pitch and yaw (0.4 deg per sec). Change from IGM guidance to orbital guidance. Set SMC corrections to zero.
T4	None	5.0	D1	Set guidance commands and minor loop guidance commands to the gimbal angles on the first pass only. Start a X freeze. Maintain constant X commands.
T4	BN ₅	15.0	D3	Start checking DI9, S/C control of Saturn. (The start of this test is keyed to the switch selector command S/C Control of Saturn Enable. If guidance reference failure occurs, DI9 checks will be enabled at the time of failure, independent of programmed time guards.) Enter orbit initialize and begin orbit navigation. Enable the following DCS commands: Memory Dump and Navigation Update.

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TABLE 1-1 EVENT SEQUENCE TIMELINE (CONTINUED)

Time Reference	EDD Symbol	Presettings (Seconds)	Source Code	Events
T4	BN ₅	15.0	D3	<p>Change the minor loop rate from 25 per sec to 10 per sec.</p> <p>Continue using MSLIM1 = 0.6 deg per sec and MSLIM2 = 0.4 deg per sec.</p> <p>Start telemetry acquisition and loss calculations.</p> <p>Set the number of permissible unreasonable backup resolver readings (MS15DT) to 6 per sec. The guidance reference failure discrettes (D04 and D06) will be set on detecting 7 unreasonable backup resolver readings in 1 sec.</p> <p>Set the gimbal angle RTC for first pass on the backup gimbal (MLKRCl) to 18.5 deg.</p> <p>Change the backup gimbal angle RTC after first use to 1.1 deg per minor loop in pitch and yaw (MLKRC3) and 1.1 deg per minor loop in roll (MLKRC5).</p> <p>Start using ΔT_{N6}.</p> <p>Change the fine gimbal angle RTC to 0.2 deg per minor loop in pitch and yaw (MLK2) and 0.2 deg per minor loop in roll (MLK12).</p>

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TABLE 1-1 EVENT SEQUENCE TIMELINE (CONTINUED)

Time Reference	EDD Symbol	Presettings (Seconds)	source Code	Events
T4	BN ₅	15.0	D3	<p>Change ladder rate limit (MSK5) to 0.24 deg per minor loop, all channels, unless guidance reference failure has occurred. In that case, leave MSK5 unchanged at zero.</p> <p>Set MS04DT to $.1/\Delta T_{N6}$.</p> <p>Set MS25DT to $10*\Delta T_{N6}$.</p> <p>Continue using the zero gimbal test constant, ML6HUN, of 1.40 deg (all channels).</p>
T4	TRNTL	Variable	E	<p>Implement the DCS return to nominal timeline. This is a transmitted parameter and has meaning only if that command has been received and accepted.</p>
T4	TSOM	Variable	E	<p>Start a DCS generalized orbital maneuver or DCS specialized maneuver. This is a transmitted parameter and has meaning only if the corresponding command has been received and accepted.</p>
T4+TBB-TB	TSEQ	Variable	E	<p>Start a DCS generalized alternate sequence. This is a transmitted parameter and has meaning only if that command has been received and accepted.</p>

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1.4 ORBITAL ATTITUDE TIMELINE

The following table (Table 1-2) describes the nominal attitude maneuver timeline from S-IVB cutoff until EOM. The following items are defined in the timeline for each maneuver:

- Maneuver number
- Description of the maneuver
- Nominal maneuver start time
- Maneuver type.

TABLE 1-2 ORBITAL ATTITUDE TIMELINE

Maneuver Number	Nominal Maneuver Time Seconds	Description of Maneuver	Maneuver Type
1	T4+0.0	Maintain vehicle attitude	X freeze
2	T4+20.0	Track local horizontal - posigrade, Position I down	Track local reference

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1.5 PRESETTINGS

Table 1-3 establishes the presettings to be used in the flight program. Program sequencing presettings are excluded since they are established in Section 1.3. For each presetting, the table gives:

- The symbol
- The required value and associated units
- The definition
- A source code.

Notice that the units of mass, force and angle presettings are not the same as those specified to be used in the flight program in Section 15 of Part I. The units used in the following table are consistent with those in other Apollo documentation while those in the flight program are dictated by programming constraints. For flight program implementation, all values given in degrees must be converted to pirads by dividing by 180. The forces, given in newtons, and masses, given in kilograms, must be converted to kilograms and $\text{kg-sec}^2/\text{m}$, respectively, by dividing each quantity by 9.80665 m/sec^2 .

The source codes are inserted for information only and are not flight program requirements. The codes denote:

- A1 Constants established by the baseline requirements (mission-independent)
- A2 Launch pad dependent constants

- B Constants established by IBM

- C2 Constants established by the orbital
timeline

- C3 Constants established by normal boost
guidance requirements

- C4 Constants established by alternate
mission requirements

- D2 Constants established by vehicle dynamics
requirements

- D3 Constants established by other program
requirements.

TABLE 1-3 PRESETTINGS
PAD 39B

EDD Symbol	Presetting	Units	Source Code	Definition
$\cos(\phi_L')$	0.87910194		A2	Cosine of geocentric latitude of launch pad
R_L	6373401.0	m	A2	Geocentric radius to the center of the IU on the launch pad, used to calculate initial conditions
$\sin(\phi_L - \phi_L')$	0.0028191516		A2	Sine of geodetic latitude minus geocentric latitude of the launch pad
$\cos(\phi_L)$	0.87775474		A2	Cosine of the geodetic latitude of the launch pad
$\sin(\phi_L)$	0.47911023		A2	Sine of the geodetic latitude of the launch pad
X_{LS}	6373376.0	m	A2	Initial radius component along X_S -axis

Note: $\phi_L = 28.6273060$
 $\phi_L' = 28.4657803$

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TABLE 1-3 PRESETTINGS (CONTINUED)
 PREFLIGHT PTL SPECIAL DATA

EDD Symbol	Presetting	Units	Source Code	Definition
A ₀₀	490.931	deg	D3	Coefficients of the variable azimuth polynomial, included in flight routines for use by preflight routines
A ₀₁	-20.131		D3	
A ₁₀	-1.2501		D3	
A ₁₁	.0975	deg ⁻¹	D3	

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TABLE 1-3 PRESETTINGS (CONTINUED)
BOOST INITIALIZATION

EDD Symbol	Presetting	Units	Source Code	Definition
A_{zL}	90.0	deg	A1	Position I Azimuth
G_H	9.7972155	m/sec ²	A1	Huntsville gravity used for flight simulation
ϕ_H	34.7166666	deg	A1	Huntsville geodetic latitude used for flight simulation
G_L	9.7923069	m/sec ²	A1	Cape Kennedy gravity used for flight simulation
\dot{X}_0	0.0	m/sec	A1	Initial velocity component along X_S axis
T1BIAS	4.9	sec	B	Time Base 1 bias used if liftoff is detected by the backup scheme

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TABLE 1-3 PRESETTINGS (CONTINUED)
 BOOST INITIALIZATION

EDD Symbol	Presetting	Units	Source Code	Definition
T_{GRRO}	TBD	sec	D3	Nominal value of T_{GRR}
TLCK	TBD		D3	Target load checksum factor

TABLE 1-3 PRESETTINGS (CONTINUED)
ACCELEROMETER PROCESSING

EDD Symbol	Presetting	Units	Source Code	Definition
F_1	7933924.0	n	C4	Predicted average S-IB thrust used to compute $(F/M)_c$
F_{2I}	526359.0	n	C4	Predicted average S-IVB buildup thrust used to compute $(F/M)_c$
F_2	994431.0	n	C4	Predicted average S-IVB thrust used to compute $(F/M)_c$ before EMRC
F_3	847773.0	n	C4	Predicted average S-IVB thrust used to compute $(F/M)_c$ after EMRC
\dot{M}_1	2878.24	kg/sec	C4	S-IB backup mass flow rate used to compute $(F/M)_c$
\dot{M}_2	239.707	kg/sec	C4	S-IVB backup mass flow rate prior to EMRC used to compute $(F/M)_c$
\dot{M}_3	202.742	kg/sec	C4	S-IVB backup mass flow rate after EMRC used to compute $(F/M)_c$
M_1	589697.6	kg	C4	Mass of the vehicle at liftoff used to compute $(F/M)_c$
M_2	134210.9	kg	C4	Mass of the vehicle (not including LES) at $T_3+T_3_{FMC}$ used to compute $(F/M)_c$

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TABLE 1-3 PRESETTINGS (CONTINUED)
ACCELEROMETER PROCESSING

EDD Symbol	Presetting	Units	Source Code	Definition
sin (2°)	.0348994967		A1	Sin (2°) used to compute the estimated thrust (F/M) misalignment uncertainty term
sin (6°)	.1045284633		A1	Sin (6°) used to compute the estimated thrust (F/M) misalignment uncertainty term if an S-IB engine out occurs

TABLE 1-3 PRESETTINGS (CONTINUED)
BOOST NAVIGATION

EDD Symbol	Presetting	Units	Source Code	Definition
MFK1	0.0120948		D2	(M/F) _S filter coefficients for S-IVB stage
MFK2	0.0213339			
MFK3	-0.0261577			
MFK4	-0.00526684			
MFK5	2.80483			
MFK6	-2.85880			
MFK7	1.24933			
MFK8	-0.197360			
FM0	12.7	m/sec ²	B	Initial (F/M) for S-IB burn (This pre-setting is valid at T1+T _{SIE0} and is also used to initialize the S-IB engine out acceleration decrease table.)
FM2	21.0	m/sec ²	B	Constant (F/M) during Time Base 2
FM4	7.4	m/sec ²	B	Initial (F/M) for S-IVB burn
(M/F) ₀	.135	sec ² /m	B	M/F at T3+T3FM used to initialize the S-IVB smoothing filter at T0+0
μ	3.986032E+14	m ³ /sec ²	A1	Product of universal gravity constant and mass of the earth

TABLE 1-3 PRESETTINGS (CONTINUED)
FIRST STAGE GUIDANCE

EDD Symbol	Presetting	Units	Source Code	Definition
B ₁₁	0.0		C4	Coefficient used to calculate delta freeze time (ΔT_f) for S-IB engine out during first S-IB engine failure interval
B ₁₂	15.0	sec	C4	Coefficient used to calculate delta freeze time (ΔT_f) for S-IB engine out during first S-IB engine failure interval
B ₂₁	-.375		C4	Coefficient used to calculate delta freeze time (ΔT_f) for S-IB engine out during second S-IB engine failure interval
B ₂₂	15.0	sec	C4	Coefficient used to calculate delta freeze time (ΔT_f) for S-IB engine out during second S-IB engine failure interval
C _{ar1}	20.0	sec	C4	Constant time bias used to modify T_{ar} in case of an S-IB engine failure prior to T_{far} .

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TABLE 1-1 PRESETTINGS
 TABULAR COMMANDED INERTIAL YAW ATTITUDE FOR
 SL-1 OPEN LOOP GUIDANCE (TIME TILT YAW COMMANDS)

Time from Time Base 1 (Symbols)	Presetting (sec)	Inertial Yaw Command (Symbols)	Presetting (Deg)
TYAW01	12.0	YAWC01	1.57500
TYAW02	46.0	YAWC02	1.57500
TYAW03	47.0	YAWC03	1.54803
TYAW04	49.0	YAWC04	1.41042
TYAW05	51.0	YAWC05	1.24992
TYAW06	55.0	YAWC06	0.83790
TYAW07	57.0	YAWC07	0.60702
TYAW08	61.0	YAWC08	0.08980
TYAW09	66.0	YAWC09	-0.67683
TYAW10	71.0	YAWC10	-1.52578
TYAW11	73.0	YAWC11	-1.81980
TYAW12	74.0	YAWC12	-1.95363
TYAW13	76.0	YAWC13	-2.07927
TYAW14	77.0	YAWC14	-2.08010
TYAW15	79.0	YAWC15	-1.99646
TYAW16	81.0	YAWC16	-1.77512
TYAW17	84.0	YAWC17	-1.34329
TYAW18	87.0	YAWC18	-0.81358
TYAW19	89.0	YAWC19	-0.46485
TYAW20	91.0	YAWC20	-0.22682
TYAW21	93.0	YAWC21	-0.10701
TYAW22	96.0	YAWC22	-0.04371
TYAW23	102.0	YAWC23	-0.20853
TYAW24	106.0	YAWC24	-0.18736
TYAW25	111.0	YAWC25	-0.14727

Note: The data in this table reflects the SL-1 Yaw Profile and is included for checkout purposes only. SL-2 data will be provided as soon as it becomes available.

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TABLE 1-3 PRESETTINGS (CONTINUED)
FIRST STAGE GUIDANCE

EDD Symbol	Presetting	Units	Source Code	Definition
F ₁₀	0.230773E+1	deg		
F ₁₁	-0.186784E+0	deg/sec		
F ₁₂	-0.524748E-2	deg/sec ²	C3	Coefficients of first segment time tilt polynomial
F ₁₃	0.140517E-4	deg/sec ³		
F ₂₀	0.117424E+2	deg		
F ₂₁	-0.740514E+0	deg/sec		
F ₂₂	0.451333E-2	deg/sec ²	C3	Coefficients of second segment time tilt polynomial
F ₂₃	-0.338949E-4	deg/sec ³		
F ₃₀	0.985854E+1	deg		
F ₃₁	-0.658243E+0	deg/sec		
F ₃₂	0.851123E-3	deg/sec ²	C3	Coefficients of third segment time tilt polynomial
F ₃₃	-0.733002E-6	deg/sec ³		
T _d	1.2375	sec	B	Time tilt bias constant
GANTRY	138.0	m	A1	Height of gantry (LUT)

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TABLE I-5 PRESETTINGS (CONTINUED)
 NOMINAL COMPUTATION CYCLE LENGTHS

EDD Symbol	Presetting	Units	Source Code	Definition
ΔT_{N1}	.77	sec	B	Nominal comp cycle length from T0+0 to T1+0
ΔT_{N2}	.75	sec	B	Nominal comp cycle length from T1+0 to T3+T3 _{IGM}
ΔT_{N3}	1.6	sec	B	Nominal comp cycle length from T3+T3 _{IGM} to S-IVB \bar{X} steering
ΔT_{N4}	1.3	sec	B	Nominal comp cycle length from start of S-IVB \bar{X} guidance until T4-T _{HSL}
ΔT_{N5}	.98	sec	B	Nominal comp cycle length from T4+0 to T4+BN ₅
ΔT_{N6}	1.0	sec	B	Nominal comp cycle length from T4 + BN ₅ to EOM

TABLE 1-3 PRESETTINGS (CONTINUED)
BOOST IGM

EDD Symbol	Presetting	Units	Source Code	Definition
V_{ex1}	4154.6328	m/sec	C3	Exhaust velocity used in first phase for IGM computations
T_{1i}	298.5	sec	C3	Nominal IGM time-to-go from $T3+T3_{IGM}$ to S-IVB EMRC
T_{10}	298.5	sec	C3	Nominal first phase burn time
τ_{10}	538.5	sec	C3	Nominal value of τ_1 used in artificial τ calculations
M_{GR}	128534.32	kg		Estimated mass of S-IVB at IGM initiation
V_{ex3}	4181.4755	m/sec	C3	Exhaust velocity used in second phase IGM computations
τ_3	281.14	sec	C3	Initial τ_3 for second phase IGM
T_{3i}	129.6	sec	C3	Nominal IGM time-to-go from S-IVB EMRC to $T4+0$

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TABLE 1-3 PRESETTINGS (CONTINUED)
BOOST IGM

EDD Symbol	Presetting	Units	Source Code	Definition
ROV	1.80		C3	Bias constant for terminal range angle
G_T	-9.35	m/sec ²	C3	Terminal gravity for S-IVB burn
X_{VgT}	-9.35	m/sec ²	C3	Terminal X gravity component for S-IVB burn
Y_{VgT}	0.0	m/sec ²	C3	Terminal Y gravity component for S-IVB burn
Z_{VgT}	0.0	m/sec ²	C3	Terminal Z gravity component for S-IVB burn
SQ1	5494.275	m/sec	B	First guess at sqrt ($\Delta \dot{X}_V^2 + \Delta \dot{Z}_V^2$) for S-IVB burn
SQ2	1.0		B	First guess at sqrt ($1 - (F'_{Sy})^2$)
ΔV_b	7.2381	m/sec	C3	Thrust decay velocity bias for S-IVB burn
YAWLIM	45.0	deg	B	Yaw guidance command limit
SMCG	0.03	rad/sec	D2	SMC gain for Time Base 3
V_{GRD}	150.0	m/sec	C3	Velocity guard for the high speed loop in S-IVB burn

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TABLE 1-3 PRESETTINGS (CONTINUED)
 TYPICAL TARGETING LOAD DATA FOR USE BY FLIGHT SIMULATION

EDD Symbol	Presetting	Units	Source Code	Definition
V_T	7855.13	m/sec	C3	Desired insertion velocity for S-IVB burn
R_T	6528178.0	m	C3	Desired insertion radius for S-IVB burn
θ_T	0.0	deg	C3	Desired insertion flight path angle
i	50.0	deg	C3	Inclination of parking orbit
λ_0	154.675	deg	C3	Longitude of descending node
$\dot{\lambda}$	0.0	deg/sec	C3	Time rate of change of the descending node
A_z	45.79968	deg	C3	Platform Azimuth

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TABLE 1-3 PRESETTINGS (CONTINUED)
ORBITAL GUIDANCE

EDD Symbol	Presetting	Units	Source Code	Definition
SP _{M1}	0.0		C2	Attitude variables for Maneuver 1
CP _{M1}	0.0			
SY _{M1}	0.0			
CY _{M1}	0.0			
RA _{M1}	0.0	deg		
TYP _{M1} (NOTE*)	0.0		B	Type of maneuver indicator for Maneuver 1
SP _{M2}	0.0		C2	Attitude variables for Maneuver 2
CP _{M2}	1.0			
SY _{M2}	0.0			
CY _{M2}	1.0			
RA _{M2}	0.0	deg		
TYP _{M2}	-1.0		B	Type of maneuver indicator for Maneuver 2

*NOTE: TYP_{M1}-TYP_{M2} indicate whether a maneuver is an inertial reference (+1), chi freeze (0), a local reference (-1), or an inertial hold of local reference (-2).

TABLE 1-3 PRESETTINGS (CONTINUED)
GRAVITY

EDD Symbol	Presetting	Units	Source Code	Definition
a _e	6378165.0	m	A1	Earth's semi-major axis
b	6356783.0	m	A1	Earth's semi-minor axis
D	0.7875E-5		C3	Fourth zonal harmonic coefficient used in the gravitational potential model
H	0.575E-5		C3	Third zonal harmonic coefficient used in the gravitational potential model
J	1.62345E-3		C3	Second zonal harmonic coefficient used in the gravitational potential model

TABLE 1-3 PRESETTINGS (CONTINUED)
 TELEMETRY ACQUISITION AND LOSS

EDD Symbol	Presetting	Units	Source Code	Definition
RSTA	6374932.0	m	D3	Mean radius of the telemetry stations
ω_E	.000025211523	pirads/ sec	A1	Earth's rotational rate

TABLE 1-3 PRESETTINGS (CONTINUED)
DRAG

EDD Symbol	Presetting	Units	Source Code	Definition	
ρ_0	0.179142E-6	kg/m ³	C3	Atmospheric density polynomial coefficients	
ρ_1	-0.37213949E-11	kg/m ⁴			
ρ_2	0.31057886E-16	kg/m ⁵			
ρ_3	-0.12962178E-21	kg/m ⁶			
ρ_4	0.26986419E-27	kg/m ⁷			
ρ_5	-0.22388267E-33	kg/m ⁸			
K_D	0.164311287E-2	m ² /kg	C3		Orbital drag model constant
C_{D1}	11.079923		C3		Drag as a function of the cosine of the angle of attack polynomial coefficients
C_{D2}	0.17954281				
C_{D3}	-2.1771971				
C_{D4}	-0.28074902				
C_{D5}	-5.8764139				

TABLE 1-5 PRESETTINGS (CONTINUED)
DRAG

EDD Symbol	Presetting	Units	Source Code	Definition
h_1	1.5E5	m	C3	Lower bound of atmospheric density polynomial
h_2	3.0E5	m	C3	Upper bound of atmospheric density polynomial
ρ_c	0.5E-7	kg/m ³	C3	Constant atmospheric density used when the altitude of the vehicle is less than h_1

1.6 FLIGHT SEQUENCING

The flight sequencing requirements for AS-206 are established in Table VII of the current revision of the Flight Sequence Program ICD 68M00001 and the approved IRN's described in Table 1-4. The information to be obtained from the ICD are switch selector command title, stage, address, and time from base. No other information contained in the ICD is to be considered a program requirement.

TABLE 1-4 SWITCH SELECTOR SEQUENCING

ICD/IRN	COMMAND	SWITCH SELECTOR			TIME FROM BASE SECONDS
		CODE	STAGE	CHN	
	LIFTOFF - START OF TIME BASE NO. 1 (TL)				TL .0
3	SINGLE ENGINE CUTOFF ENABLE	0101 1010	S1B	100	TL + 5.8
68M00001	LOX TANK PRESSURIZATION SHUTOFF VALVES CLOSE ON	0110 1010	S1VB	79	TL + 6.0
3	MULTIPLE ENGINE CUTOFF ENABLE NO.1	0001 0001	S1B	16	TL + 10.0
3	MULTIPLE ENGINE CUTOFF ENABLE NO.2	0110 1111	S1B	15	TL + 10.1
7	SENSOR PANEL NO.1, COVER NO.2 EXPULSION	0111 0100	IU	54	TL + 10.2
7	SENSOR PANEL NO.1, COVER NO.2 EXPULSION RESET	0110 1011	IU	59	TL + 10.4
68M00001	TELEMETRY CALIBRATION ON	0101 1111	S-1B	2	TL + 20.0
68M00001	TELEMETRY CALIBRATION OFF	0000 1111	S-1B	39	TL + 25.0
68M00001	TELEMETRY CALIBRATOR IN-FLIGHT CALIBRATE ON	0010 0010	IU	23	TL + 27.0
68M00001	TELEMETRY CALIBRATOR IN-FLIGHT CALIBRATE OFF	0001 0010	IU	24	TL + 32.0
68M00001	LAUNCH VEHICLE ENGINES EDS CUTOFF ENABLE	0011 0001	IU	38	TL + 40.0
68M00001	TELEMETRY CALIBRATOR IN-FLIGHT CALIBRATE ON	0010 0010	IU	23	TL + 50.2
68M00001	TELEMETRY CALIBRATOR IN-FLIGHT CALIBRATE OFF	0001 0010	IU	24	TL + 55.2

TABLE 1-4 SWITCH SELEUTOR SEQUENCING (CONTINUED)

ICD/IRN	COMMAND	SWITCH SELEUTOR			TIME FROM BASE SECONDS
		CODE	STAGE	LHN	
68M00001	FLIGHT CONTROL COMPUTER SWITCH POINT NO. 1	0111 1110	IU	43	TI + 100.0
68M00001	FLIGHT CONTROL COMPUTER SWITCH POINT NO. 2	0100 0000	IU	21	TI + 100.2
68M00001	TELEMETER CALIBRATION ON	0101 1111	S-1B	2	TI + 119.8
68M00001	FLIGHT CONTROL COMPUTER SWITCH POINT NO. 3	0101 0001	IU	22	TI + 120.0
68M00001	IU CONTROL ACCELERUMETER POWER OFF	0111 0101	IU	106	TI + 120.2
68M00001	TELEMETER CALIBRATION OFF	0000 1111	S-1B	39	TI + 124.8
68M00001	TM CALIBRATE ON	0100 1010	S1VB	62	TI + 127.7
68M00001	TM CALIBRATE OFF	0000 0111	S1VB	63	TI + 128.7
68M00001	EXCESS RATE (P,Y,R) AUTO-ABORT INHIBIT ENABLE	0110 1111	IU	15	TI + 131.2
68M00001	EXCESS RATE (P,Y,R) AUTO-ABORT INHIBIT AND SWITCH RATE GYRGS SC INDICATION A	0101 1111	IU	2	TI + 131.4
68M00001	S-1B TWO ENGINES OUT AUTO-ABORT INHIBIT ENABLE	0000 1110	IU	51	TI + 131.6
68M00001	S-1B TWO ENGINES OUT AUTO-ABORT INHIBIT	0001 1110	IU	35	TI + 131.8
68M00001	PROPELLANT LEVEL SENSORS ENABLE	0111 0111	S-1B	104	TI + 132.0

TABLE 1-4 SWITCH SELECTOR SEQUENCING (CONTINUED)

ICD/IRN	COMMAND	SWITCH SELECTOR			TIME FRM BASE SECONDS
		CODE	STAGL	CFN	
	S-1B PROPELLANT LEVEL SENSOR ACTUATION-START OF TIME BASE NO. 2 (T2)		S-1B	T2	.0
68M00001	EXCESS RATE (ROLL) AUTO-ABORT INHIBIT ENABLE	0100 1111	IU	34 T2 +	.2
68M00001	EXCESS RATE (RCLL) AUTO-ABORT INHIBIT AND SWITCH RATE GYROS SC INDICATION B	0111 0001	IU	50 T2 +	.4
68M00001	INBOARD ENGINES CUTOFF	0100 0100	S-1B	98 T2 +	3.1
68M00001	AUTO-ABORT ENABLE RELAYS RESET	0001 0001	IU	16 T2 +	3.4
68M00001	CHARGE ULLAGE IGNITION EBW FIRING UNITS	0111 0100	S1VB	54 T2 +	3.6
68M00001	Q-BALL POWER OFF	0111 1111	IU	1 T2 +	4.0
68M00001	PREVALVES OPEN	0110 1001	S1VB	83 T2 +	4.3
68M00001	LOX DEPLETION CUTOFF ENABLE	0000 0110	S-1B	57 T2 +	4.6
68M00001	FUEL DEPLETION CUTOFF ENABLE	0110 1010	S-1B	79 T2 +	5.6

TABLE 1-4 SWITCH SELECTOR SEQUENCING (CONTINUED)

ICD/IRN	COMMAND	SWITCH SELECTOR			TIME FROM BASE SECONDS
		CODE	STAGE	CHN	
	S-1B OUTBOARD ENGINES CUTOFF - START OF TIME BASE NO. 3 (I13)				T3 .0
68M00001	S-1B OUTBOARD ENGINES CUTOFF	CC11 C011	S-1B	18	T3 + .1
1	LOX TANK PRESSURIZATION SHUTOFF VALVES OPEN	0111 1010	S1VB	80	T3 + .2
1	LOX TANK FLIGHT PRESSURIZATION SYSTEM ON	0111 1CC1	S1VB	103	T3 + .3
1	S-1VB ENGINE CUTOFF NO. 1 OFF	0111 0010	S1VB	13	T3 + .4
1	S-1VB ENGINE CUTOFF NO. 2 OFF	CC00 1100	S1VB	49	T3 + .5
7	SENSOR PANEL NO.1, COVER NO.3 AND PANEL NO.2, COVERS NO.2 AND NO.4 EXPULSION	0110 0100	IU	55	T3 + C.6
7	SENSOR PANEL NO.1, COVER NO.3 AND PANEL NO.2, COVERS NO.2 AND NO.4 EXPULSION RESET	0101 0100	IU	56	T3 + C.8
68M00001	ULLAGE ROCKETS IGNITION	0101 0100	S1VB	56	T3 + 1.1
6EM00001	S-1B/S-1VB SEPARATION ON	0010 0010	S-1B	23	T3 + 1.3
6EM00001	FLIGHT CONTROL COMPUTER S-1VB BURN MODE ON A	0010 CC01	IU	53	T3 + 1.5

TABLE 1-4 SWITCH SELECTION SEQUENCING (CONTINUED)

ICD/IRN	COMMAND	SWITCH SELECTOR			TIME FROM BASE SECONDS
		CODE	STAGE	CHN	
68M00001	FLIGHT CONTROL COMPUTER S-IVB BURN MODE ON B	0010 1101	IU	6	T3 + 1.7
68M00001	ENGINE READY BYPASS ON	0110 0011	SIVB	10	T3 + 1.9
68M00001	LH2 CHILLDOWN PUMP OFF	0110 1011	SIVB	59	T3 + 2.1
68M00001	LOX CHILLDOWN PUMP OFF	0010 0010	SIVB	23	T3 + 2.3
68M00001	S-IVB ENGINE CUT INDICATION A ENABLE	0001 0011	IU	9	T3 + 2.4
68M00001	S-IVB ENGINE OUT INDICATION B ENABLE	0011 1100	IU	29	T3 + 2.6
68M00001	ENGINE IGNITION SEQUENCE START	0001 0011	SIVB	9	T3 + 2.7
68M00001	ENGINE IGNITION SEQUENCE START RELAY RESET	0101 1101	SIVB	27	T3 + 3.2
68M00001	FUEL INJECTION TEMPERATURE OK BYPASS	0111 0011	SIVB	11	T3 + 3.7
68M00001	LH2 TANK PRESSURIZATION CONTROL SWITCH ENABLE	0001 1001	SIVB	68	T3 + 5.3
1	P.U. MIXTURE RATIO 5.5 ON	0100 1111	SIVB	34	T3 + 8.7
68M00001	CHARGE ULLAGE JETTISON EBW FIRING UNITS	0110 0100	SIVB	55	T3 + 10.2
68M00001	ULLAGE ROCKETS JETTISON	0001 1010	SIVB	57	T3 + 13.3
68M00001	FUEL INJECTION TEMPERATURE OK BYPASS RESET	0001 0001	SIVB	16	T3 + 13.7
68M00001	ULLAGE EBW FIRING UNITS CHARGE RELAYS RESET	0101 1100	SIVB	88	T3 + 19.3

TABLE 1-4 SWITCH SELECTOR SEQUENCING (CONTINUED)

ICD/IRN	COMMAND	SWITCH SELECTOR			TIME FROM BASE SECONDS
		CODE	STAGE	CHN	
68M00001	ULLAGE ROCKETS IGNITION AND JETTISON RELAYS RESET	0010 1011	SIVB	73	T3 + 19.5
68MC0001	HEAT EXCHANGER BYPASS VALVE ENABLE ON	0111 0001	SIVB	50	T3 + 24.0
68M00001	TELEMETRY CALIBRATOR IN-FLIGHT CALIBRATE ON	0010 0010	IU	23	T3 + 25.4
68M00001	TELEMETRY CALIBRATOR IN-FLIGHT CALIBRATE OFF	0001 0010	IU	24	T3 + 20.4
68M00001	WATER COOLANT VALVE OPEN	0110 0101	IU	107	T3 + 38.4
68M00001	FLIGHT CONTROL COMPUTER SWITCH POINT NO. 4	0110 0001	IU	4	T3 + 42.0
68M00001	FLIGHT CONTROL COMPUTER SWITCH POINT NO. 5	0011 0010	IU	44	T3 + 203.7
68M00001	TELEMETRY CALIBRATOR IN-FLIGHT CALIBRATE ON	0010 0010	IU	23	T3 + 205.4
68M00001	TELEMETRY CALIBRATOR IN-FLIGHT CALIBRATE OFF	0001 0010	IU	24	T3 + 210.4
68M00001	LH2 TANK PRESSURIZATION CONTROL SWITCH DISABLE	0010 1001	SIVB	69	T3 + 202.9
2	P.U. MIXTURE RATIO 3.5 OFF	0001 1110	SIVB	35	T3 + 327.9
2	P.U. MIXTURE RATIO 4.8 ON	0100 0011	SIVB	32	T3 + 328.1
68M00001	TELEMETRY CALIBRATOR IN-FLIGHT CALIBRATE ON	0010 0010	IU	23	T3 + 355.4
68M00001	TELEMETRY CALIBRATOR IN-FLIGHT CALIBRATE OFF	0001 0010	IU	24	T3 + 360.4

TABLE 1-4 SWITCH SELECTOR SEQUENCING (CONTINUED)

ICC/IRN	COMMAND	SWITCH SELECTOR			TIME FROM BASE SECONDS
		CODE	STAGE	CFN	
2	PROPELLANT DEPLETION CUTOFF ARM	0000 C110	S1VB	57	T3 + 437.2

TABLE 1-4 SWITCH SELECTOR SEQUENCING (CONTINUED)

ICC/IRN	COMMAND	SWITCH SELECTOR			TIME FROM BASE SECONDS
		CODE	STAGE	CHN	
	S-IVB ENGINE CUTOFF - START OF TIME BASE 4 (T4)			T4	0.0
1	S-IVB ENGINE CUTOFF NO. 1 ON	0100 1101	SIVB	12 T4	.1
1	S-IVB ENGINE CUTOFF NO. 2 ON	CC10 1100	SIVB	43 T4	.2
4	LOX TANK NPV VALVE OPEN ON	0101 1110	SIVB	42 T4	.3
68M00001	LH2 TANK LATCHING RELIEF VALVE OPEN ON	0101 0110	SIVB	55 T4	.4
2	PREVALVES CLOSE ON	CC11 0110	SIVB	82 T4	.5
2	CHILLDOWN SHUTOFF VALVES CLOSE	0101 0101	SIVB	91 T4	.6
68M00001	LOX TANK FLIGHT PRESSURIZATION SHUTOFF VALVES CLOSE	C11C 1010	SIVB	75 T4	.8
1	LCX TANK FLIGHT PRESSURIZATION SYSTEM OFF	0111 0111	SIVB	104 T4	1.0
68M00001	PRCFELLANT DEPLETION CUTOFF DISARM	0100 0100	SIVB	98 T4	1.8
68M00001	P.U. MIXTURE RATIO 4.7 OFF	0001 1100	SIVB	33 T4	2.2
68M00001	FLIGHT CONTROL COMPUTER S-IVB BURN MODE OFF A	0100 1101	IU	12 T4	3.5
68M00001	FLIGHT CONTROL COMPUTER S-IVB BURN MODE OFF B	0000 0010	IU	5 T4	3.7

TABLE 1-4 SWITCH SELECTOR SEQUENCING (CONTINUED)

ICC/IRN	COMMAND	SWITCH SELECTOR			TIME FRM BASE SECONDS
		CODE	STAGE	CHN	
68M00001	AUX. HYDRAULIC PUMP FLIGHT MODE OFF	0011 1100	SIVB	29	T4 + 3.9
68M00001	S/C CONTROL OF SATURN ENABLE	0011 0011	IU	18	T4 + 5.0
68M00001	RATE MEASUREMENTS SWITCH	0001 1111	IU	17	T4 + 6.0
2	S-IVB ENGINE EDS CUTOFFS DISABLE	0110 0010	IU	3	T4 + 10.0
4	LOX TANK NPV VALVE OPEN OFF	0000 0001	SIVB	37	T4 + 200.0
2	LOX TANK VENT AND NPV VALVES BOOST CLOSE ON	0011 1011	SIVB	95	T4 + 203.0
2	LOX TANK VENT AND NPV VALVES BOOST CLOSE OFF	0001 1011	SIVB	96	T4 + 205.0
68M00001	P.U. INVERTER AND DC POWER OFF	0011 1111	SIVB	8	T4 + 240.0
4	LH2 TANK LATCHING RELIEF VALVE OPEN OFF	0101 1010	SIVB	100	T4 + 320.0
2	LH2 TANK VENT AND LATCHING RELIEF VALVES BOOST CLOSE ON	0110 0110	SIVB	77	T4 + 323.0
2	LH2 TANK VENT AND LATCHING RELIEF VALVES BOOST CLOSE OFF	0111 0110	SIVB	78	T4 + 325.0
2	LH2 TANK LATCHING RELIEF VALVE OPEN ON	0101 0110	SIVB	99	T4 + 900.0
4	LOX TANK NPV VALVE OPEN ON	0101 1110	SIVB	42	T4 + 900.2

TABLE I-4 SWITCH SELECTOR SEQUENCING (CONTINUED)

ICC/IRN	COMMAND	SWITCH SELECTOR		TIME FROM BASE SECONDS
		CODE	STAGE CHN	
4	LH2 TANK LATCHING RELIEF VALVE LATCH ON	0010 1110	SIVB 52	T4 + 902.0
4	LOX TANK NPV VALVE LATCH OPEN ON	0011 0110	SIVB 101	T4 + 902.2
4	LH2 TANK LATCHING RELIEF VALVE OPEN OFF	0101 1010	SIVB 100	T4 + 903.0
4	LOX TANK NPV VALVE OPEN OFF	0000 0001	SIVB 37	T4 + 903.2
4	LH2 TANK LATCHING RELIEF VALVE LATCH OFF	0101 0010	SIVB 19	T4 + 904.0
4	LOX TANK NPV VALVE LATCH OPEN OFF	0010 0110	SIVB 102	T4 + 904.2
7	SENSOR PANEL NO.1, COVER NO.4 AND PANEL NO.2, COVER NO. 3 EXPULSION	0100 1011	IU 112	T4 + 2752.0
7	SENSOR PANEL NO.1, COVER NO.4 AND PANEL NO.2, COVER NO. 3 EXPULSION RESET	0101 1011	IU 60	T4 + 2752.2
2	PASSIVATION ENABLE	0110 0111	SIVB 85	T4 + 4990.2
2	LOX TANK FLIGHT PRESSURIZATION SHUTOFF VALVES CLOSE OFF	0111 1010	SIVB 80	T4 + 5000.0
2	ENGINE HELIUM CONTROL VALVE OPEN ON	0001 0101	SIVB 109	T4 + 5000.2
2	ENGINE HELIUM CONTROL VALVE OPEN OFF	0011 0100	SIVB 110	T4 + 6000.0

TABLE 1-4 SWITCH SELECTOR SEQUENCING (CONTINUED)

ICD/IRN	COMMAND	SWITCH SELECTOR			TIME FRM BASE SECONDS
		CODE	STAGE	CHN	
2	PASSIVATION DISABLE	0101 0111	SIVB	86	T4 + 6001.0
2	LOX TANK FLIGHT PRESSURIZATION SHUTOFF VALVES CLOSE ON	0110 1010	SIVB	79	T4 + 7800.0
4	ENGINE PUMP PURGE CONTROL VALVE ENABLE ON	0001 0010	SIVB	24	T4 + 11200.0
4	LOX TANK PRESSURIZATION SHUTOFF VALVES OPEN	0111 1010	SIVB	80	T4 + 15600.0
4	ENGINE PUMP PURGE CONTROL VALVE ENABLE OFF	0011 1101	SIVB	25	T4 + 16200.0
2	LOX TANK FLIGHT PRESSURIZATION SHUTOFF VALVES CLOSE ON	0110 1010	SIVB	79	T4 + 16600.0

TABLE 1-4 SWITCH SELECTOR SEQUENCING (CONTINUED)

ICD/IRN	COMMAND	SWITCH SELECTOR			TIME FROM BASE SECONDS
		CODE	STAGE	CHN	
	WATER COOLANT VALVE SWITCHING (SEE NOTE 1)				
68M00001	WATER COOLANT VALVE OPEN	0110 0101	IU	107	
68M00001	WATER COOLANT VALVE CLOSED	0100 0101	IU	108	
	SPECIAL SEQUENCE FOR VEHICLE TELEMETRY CALIBRATION (SEE NOTE 2)				
68M00001	TELEMETRY CALIBRATOR IN-FLIGHT CALIBRATE ON	0010 0010	IU	23	ACC + 60.0
68M00001	TM CALIBRATE ON	0100 1010	SIVB	62	ACC + 63.0
68M00001	TM CALIBRATE OFF	0000 0111	SIVB	63	ACC + 64.0
68M00001	TELEMETRY CALIBRATOR IN-FLIGHT CALIBRATE, OFF	0001 0010	IU	24	ACC + 65.0

TABLE 1-4 SWITCH SELECTOR SEQUENCING (CONTINUED)

ICD/IRN	COMMAND	SWITCH SELECTOR			TIME FROM BASE SECONDS
		CODE	STAGE	CHN	
	S-IVB CUTOFF SEQUENCE (SEE NOTE 3)				
1	SIVB ENGINE CUTOFF NO. 1 ON	0100 1101	SIVB	12	
1	SIVB ENGINE CUTOFF NO. 2 ON	0010 1100	SIVB	48	

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Notes on Table 1-4:

Note 1:

Each of these switch selector commands must be programmed as an alternate switch selector sequence. Requirements for issuance of these alternate sequences are detailed in Section 7.4.10.

Note 2:

The IU telemetry and S-IVB telemetry shall be calibrated after orbital insertion by using a special sequence. This special sequence of events consists of IU and S-IVB telemetry calibration commands and shall be initiated by the LVDC using special tracking station acquisition logic. The first telemetry calibrate command shall be issued 60.0 seconds after station acquisition as determined by the LVDC.

Note 3:

This switch selector sequence must be issued in response to S-IVB velocity cutoff or Spacecraft initiated S-IVB cutoff. It should be noted that if Time Base 4 is initiated prior to the completion of this sequence, the sequence must be terminated. The second command of this sequence must be checked immediately after the first command.

1.7 DIGITAL COMMAND SYSTEM (DCS) MODE COMMAND SUMMARY

Table 1-5 defines the only DCS commands which are accepted by the AS-206 flight program and the interval during which each command is accepted. The required program response to each command is defined in Section 10 of Part I.

TABLE 1-5 DCS MODE COMMAND FORMAT

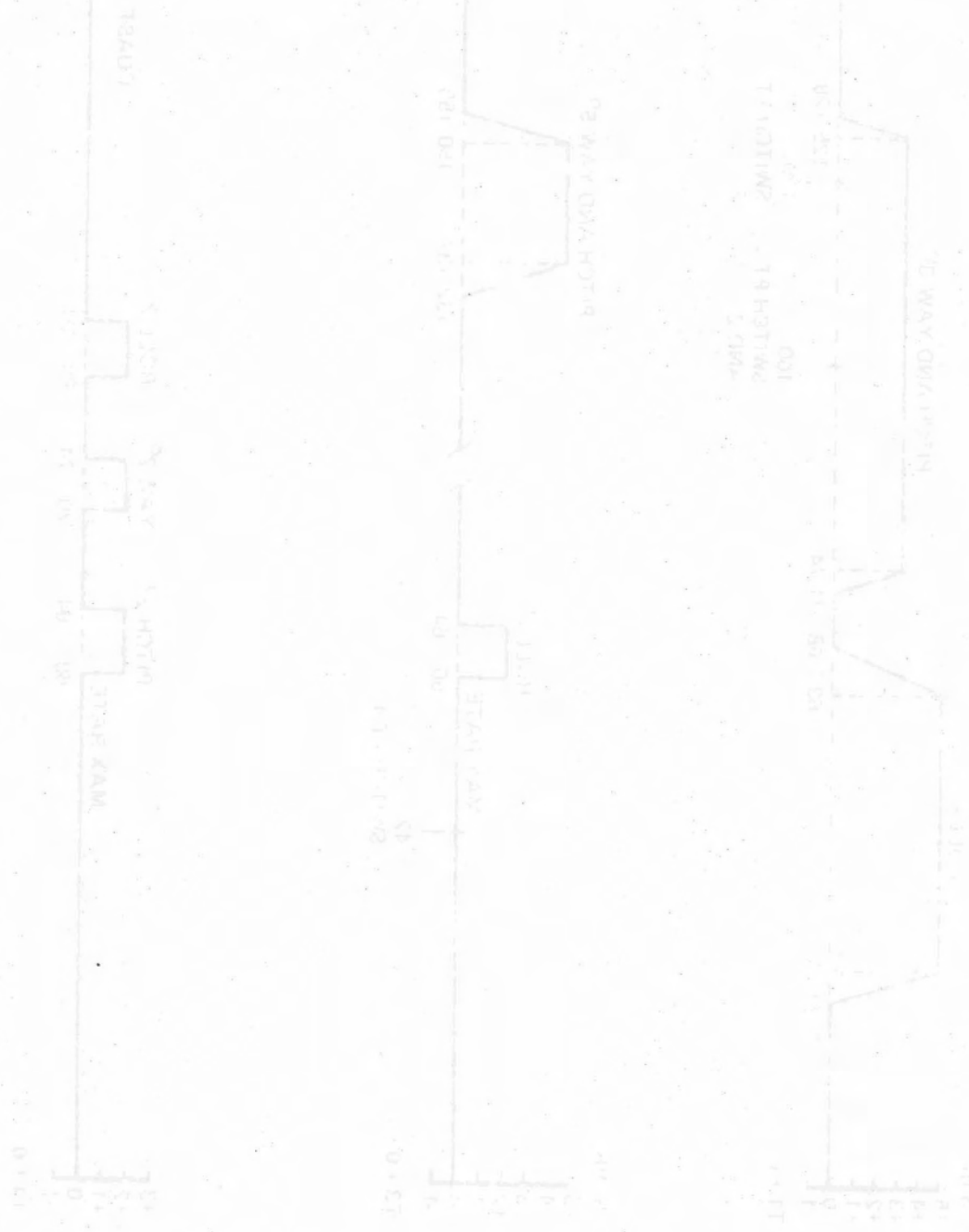
Octal Rep. of LVDC Bit Position S-5	Binary Rep. of LVDC Bit Position		Definition	Acceptance Times	
	S-6	7-13			
10	0010000	Complement of Bits S-6	Time Base Update	T4+ 0→End of Mission (EOM)	
11	0010010		Navigation Update	T4+ 15→EOM	
12	0010100		Generalized Switch Selector	T4+ 0→EOM	
13	0010110		Memory Dump	Prelaunch Command Mode T4+ 15→EOM	*
20	0100000		Terminate	When any other DCS command is allowed	*
32	0110100		Targeting Load	Prelaunch Command Mode	*
35	0111010		Execute Generalized Maneuver	T4+ 0→EOM	*
36	0111100		Return to Nominal Timeline	T4+ 0→EOM	*
45	1001010		Inhibit Water Control Valve Logic	T4+ 0→EOM	*

1.8 FLIGHT SIMULATION LADDER PROFILES

Figure 1-2 depicts the signal profiles required on the ladder outputs during flight simulation tests. These ladder profiles must be issued as specified in Section 12.2.2.5 of Part I.

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FIGURE 1-2 FLIGHT SIMULATION LADDER PROFILES



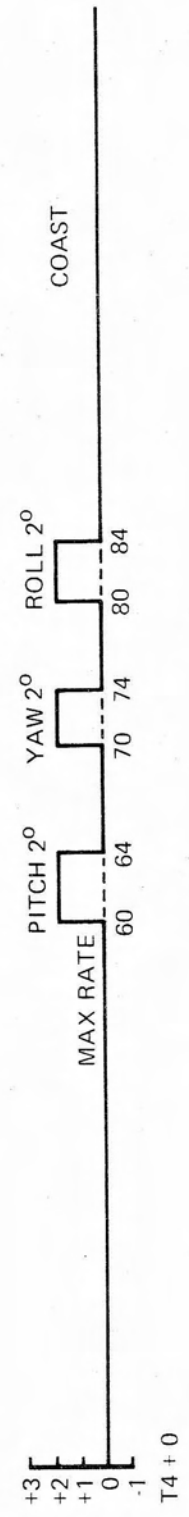
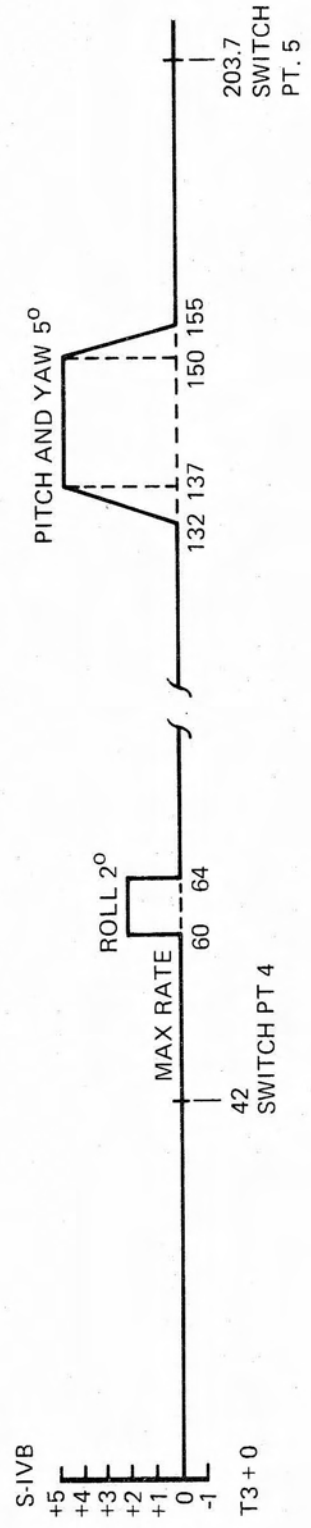
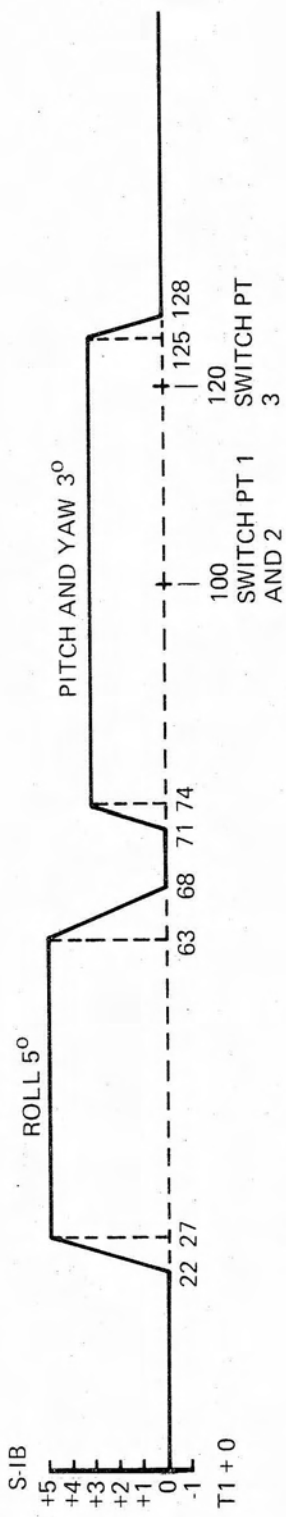


FIGURE 1-2. FLIGHT SIMULATION LADDER PROFILES



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