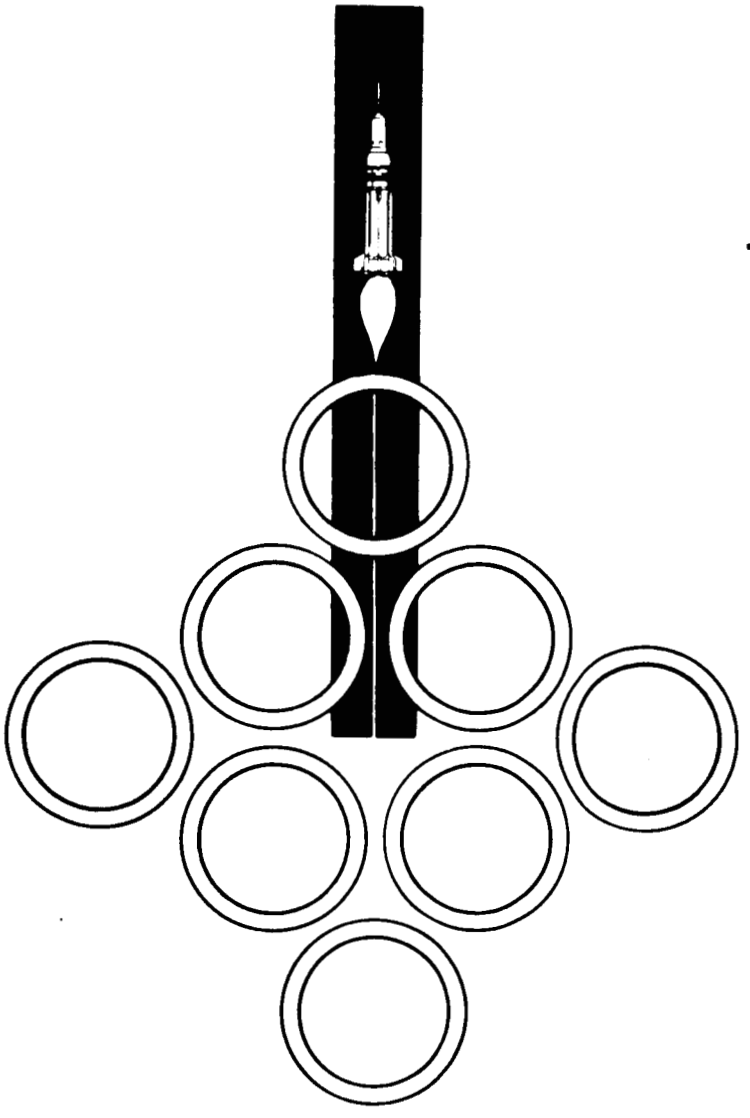

ENGINEERING DEPARTMENT

TECHNICAL MANUAL

SDES-64-414

Saturn I

LAUNCH VEHICLE SA-8 AND LAUNCH COMPLEX 37B FUNCTIONAL SYSTEMS DESCRIPTION

Volume X

SEPARATION AND FLIGHT TERMINATION SYSTEMS FUNCTIONAL DESCRIPTION, INDEX OF FINDING NUMBERS, AND MECHANICAL SCHEMATICS

SPACE DIVISION CHRYSLER CORPORATION

SATURN I
LAUNCH VEHICLE SA-8
AND
LAUNCH COMPLEX 37B
FUNCTIONAL SYSTEMS DESCRIPTION

VOLUME X
SEPARATION AND FLIGHT TERMINATION SYSTEMS FUNCTIONAL DESCRIPTION, INDEX OF FINDING NUMBERS AND MECHANICAL SCHEMATICS

APRIL 1964

CHRYSLER CORPORATION SPACE DIVISION - NEW ORLEANS, LOUISIANA

FOREWORD

This volume is part of a ten-volume set that describes the mechanical and electromechanical systems of launch vehicle SA-8 and launch complex 37B that function either during the prelaunch countdown or in the event of a launch abort. The mechanical and electromechanical systems of the launch vehicle that function during flight or flight abort are also described.

The ten-volume set is prepared for the Functional Integration Section, Systems Integration & Operation Branch, Vehicle Systems Division, P&VE Laboratory, MSFC, by Systems Engineering Branch, Chrysler Corporation Space Division under contract NAS 8-4016.

This volume describes subsystems and components of launch vehicle SA-8 and launch complex 37B that make up the separation and flight termination systems. The information is presented in three sections: functional description. index of finding numbers, and mechanical schematics.

The technical content reflects the functional system design information available on March 1, 1964.

TABLE OF CONTENTS

Section	Subject	Page
1	FUNCTIONAL DESCRIPTION	1.1
	1.1 INTRODUCTION	1.1
	1.2 SEPARATION SYSTEM	1.1
	1.2.1 Component Description	1.2
	1.2.2 System Operation	1.3
	1.3 FLIGHT TERMINATION SYSTEM	1.5
	1.3.1 Component Description	1.5
	1.3.2 System Operation	1.7
2	INDEX OF FINDING NUMBERS	2.1
3	MECHANICAL SCHEMATICS	3.1
	APPENDIX A	A.1

LIST OF ILLUSTRATIONS

Figure		Page
1-1	S-I Stage/S-IV Stage Separation Sequence	1.9
3-1	Launch Vehicle Separation Components	3.3
3-2	Launch Vehicle Flight Termination Components	3.5

SECTION 1

FUNCTIONAL DESCRIPTION

1.1 INTRODUCTION

Separation of the S-IV stage from the S-I/S-IV interstage structure is programmed for approximately 149.2 seconds after liftoff; however, the precise time of separation is dependant on propellant depletion.

The act of separation is presented in terms of a separation sequence (see figure 1-1) which begins at liftoff and is not completed until approximately 20 seconds after the S-IV stage separates from the S-IV aft interstage.

Flight termination is the alternative which must be selected by the range safety officer in the event of an abnormal flight that produces unsafe conditions. Flight termination is in essence a propellant dispersion and ignition sequence. This minimizes the explosion that occurs at the instant of termination. Multiple ground safety techniques are employed to eliminate the possibility of inadvertent ground detonation of the explosive charges used in the system.

The entire flight termination sequence, from engine shut down to propellant tank rupture. is presented.

1.2 SEPARATION SYSTEM

S-I/S-IV stage separation begins with the initiation of the separation signal; however, this signal will not be generated until the S-I stage engines have shut down and the launch vehicle is in a coast mode of operation.

When all prerequisite conditions have been satisfied, the separation signal is initiated by the flight computer. This occurs approximately 149.2 after liftoff.

Separation occurs between the S-I and S-IV stages of the SA-8 launch vehicle. The plane of physical separation is located at the top of the S-IV aft interstage structure at a point corresponding to vehicle station 1146.693. (See figure 3.1). The S-IV aft interstage is rigidly fastened to the S-I stage spider beam and remains with the S-I stage after separation.

Physical separation begins with the separation signal which initiates the sequence of events required for programmed in-flight separation. This sequence is as follows:

a. Firing of frangible nuts on the separation bolt and frangible nut assembly.

b. Firing the Ullage rockets on the S-IV stage.

c. Firing retrorockets on the S-I stage.

1.2.1 Component Description - Major components of the separation system consists of vent panels, separation bolts with frangible nuts, ullage rockets, and retrorockets. These components are illustrated in figure 3-1 and are described in the following paragraphs.

1.2.1.1 Vent Panels. Fiberglass panels cover eight vent ports which are equally spaced around the base of the S-I/S-IV interstage. Each fiberglass panel has a Detonating Cord Assembly E308 installed on its edge. These eight detonating cords are joined end-to-end with coupling blocks to form a continous explosive harness. The two harness ends are connected to a detonator block which contains two Exploding Brige Wire (EBW) Detonators E353.

The eight vent ports, when opened, vent the oxygen discharged into the interstage structure during RL10A-3 engine LOX system chill down.

1.2.1.2 Separation Bolts with Frangible Nuts. Four bolts with Frangible Nuts E302 are used to join the S-IV stage to the S-IV aft interstage structure at station 1146.693. Explosive Harness Assembly E313 is ignited at both ends by EBW Detonators E351 causing the frangible nuts to split. A spring assembly causes each separation bolt to eject from the S-IV stage. Separation bolts with frangible nuts are also used to jettison Ullage Rocket Motors E290.

1.2.1.3 Ullage Rocket Motors. Four solid propellant Ullage Rocket Motors E290 are mounted on the aft skirt of the S-IV stage, one at each of the four fin lines. The ullage rockets are mounted at a 35-degree cant from vehicle centerline to minimize effects of exhaust gases on vehicle hardware.

Primary ullage rocket function is to impart forward acceleration to pre-position S-IV stage propellant. The gravity load thus imposed by rocket thrust forces S-IV propellant to the RL10A-3 engines prior to ignition. This acceleration also aids in stage separation.

Each ullage rocket is fired by self-contained Igniter E294 that has two electrically activated Initiators E291 thus providing the required redundant ignition system capability.

The ullage rockets are ignited just prior to separation and burn for about 3.5 seconds. After burnout, the ullage rockets are jettisoned by firing two Frangible Nuts E292 that attach each ullage rocket to the S-IV stage. All eight frangible nuts are fired simultaneously through interconnecting Explosive Harness Assemblies E293-1 and E293-2. These explosive harness assemblies are connected to the EBW detonators inside a detonator block assembly which interconnects the EBW detonators with the four sets of frangible nuts. The explosive lead assemblies used in this interconnection are redundant firing mechanisms and assure simultaneous firing even if one EBW detonator fails to operate.

1.2.1.4 Retrorocket Motor Assemblies. Four solid propellant Retrorocket Motor Assemblies B500 are mounted at the top of the S-I stage. The motor nozzles are

mounted at a cant of about 11 degrees from the vehicle centerline and are pointed in the direction of the S-IV aft interstage. Retrorocket thrust vectors converge at a point located on the centerline of the S-1 stage and produce a retarding force to slow the S-I stage. This slowing action ensures positive S-I/S-IV stage separation and precludes the possibility of stage interaction. Each retrorocket is ignited by self-contained Igniter Assembly B503 with two electrically fired Initiator Assemblies B501 which provides a redundant ignition system. The retrorockets are ignited just after release of the S-IV stage from the S-IV aft interstage structure. A short time delay between release of the S-IV stage and ignition of the retrorocket ensures that propellant in the S-IV stage will not be unseated by deceleration of the S-I stage.

1.2.2 System Operation - S-I/S-IV stage separation is initiated by a signal from the instrument unit flight computer. The separation signal is initiated after the S-I stage engines have shut down and the vehicle is in a coast mode of operation. The entire sequence of events, starting at vehicle liftoff and ending at ullage rocket jettison (separation sequence complete), is illustrated in figure 1-1. The following paragraphs summarize these events.

1.2.2.1 Operation Prior to Separation Signal. During the time interval between liftoff and initiation of the separation signal (approximately 149.2 seconds), the flight computer controls the preseparation operations of the RL10A-3 engines of the S-IV stage, shuts down the inboard engines of the S-I stage, and then shuts down the outboard engines of the S-I stage. These operations, shown graphically in figure 1-1, occur as follows:

a. Hydrogen vent duct purge commences at liftoff and continues. This high flow rate helium purge maintains a low-oxygen concentration in the ducts to eliminate the possibility of explosion during chilldown of the LH_2 fuel system.

b. The electropneumatic valves in the S-I stage propellant tank pressurization system, which are all active at liftoff, are sequentially deactivated as requirements for such pressurization are reduced.

c. Two solenoid valves operate to connect the propellant tank pressurization GN_2 spheres in parallel with the liquid oxygen/solid oxygen (LOX/SOX) disposal system GN_2 spheres.

d. The separation television camera is turned on.

e. RL10A-3 hydrogen fuel system plumbing chilldown is started. This action commences at liftoff plus 109.3 seconds and continues for about 41.6 seconds. The gaseous hydrogen (GH_2) produced in the chilldown is dumped overboard through the hydrogen vent ducts. The continuing helium purge of the vent ducts prevents explosion.

f. At liftoff plus approximately 134.4 seconds, the liquid level sensors (B104, volume I and B161, volume II) in the S-I stage propellant tanks are armed.

g. Two seconds after any one of the sensors actuate (low fuel or low LOX level), the flight computer sends the necessary signals to shut down the S-I stage inboard engines.

h. Just prior to S-I stage inboard engine cutoff, RL10A-3 engine LOX system chilldown is started and vent panel EBW Detonators E353 are simultaneously fired. The EBW detonators ignite Detonating Cord Assemblies E308-1 and E308-2, causing the vent ports to be opened. LOX/SOX solenoid valves are opened during LOX prestart to admit GN_2 to the RL10A-3 engine area. Four LOX/SOX valves are opened prior to S-I stage inboard engine shutdown and three more are opened after inboard engine shutdown.

i. At separation minus 1.8 seconds (approximately liftoff plus 147.2 seconds), a signal from the flight computer causes the thrust OK pressure switches of the outboard engines to be electrically interconnected and arms liquid level sensors (B125-1 and B125-2, volume 1) in fuel tanks F2 and F4. After this occurs any one of three actions will cause the outboard engines to shut down.

   1. Deactivation of any one of the thrust OK pressure switches due to LOX depletion.

   2. Activation of liquid level sensors due to fuel depletion.

   3. Intiation of a backup signal by the flight computer approximately six seconds after inboard engine cutoff. This happens if neither 1 of 2 above occurs.

j. At separation minus 0.1 seconds, Ullage Rocket Motors E290 are ignited by a signal from the flight computer. Forward thrust of the ullage rockets serves to pre-position S-IV stage propellant.

1.2.2.2 Operation After Separation Signal. Separation of the S-I and S-IV stages is initated by a separation signal from the flight computer. This occurs approximately 149.2 seconds after liftoff. The actions associated with stage separation occurs as follows:

a. The separation signal actuates a control switch to transfer engine control and telemetry signals from the S-I stage to the S-IV stage. Simultaneously, Frangible Nuts E302 are fired to release the S-IV stage from the S-IV aft interstage structure.

b. After a programmed time interval (exact time to be determined later), the retrorockets on the S-I stage are fired. The time interval is required to assure adequate S-I/S-IV stage separation and thus preclude the possibility

that firing the S-I stage retrorockets will upset propellant seating in the S-IV stage. Since ullage rocket operation and retrorocket operation overlap, the two stages rapidly move apart. This assures adequate spacing prior to RL10A-3 engine ignition to prevent S-I/S-IV stage interaction.

c. RL10A-3 engine ignition occurs.

d. At separation plus 20 seconds, the two Frangible Nuts E292 that secure each ullage rocket are fired and the ullage rockets are jettisoned to complete the operating sequence.

1.3 FLIGHT TERMINATION SYSTEM

Launch vehicle flight can be terminated any time after liftoff if the vehicle becomes a safety hazzard. Flight termination is accomplished through the use of explosive charges that rupture the vehicle propellant tanks and cause the propellants to disperse.

The explosive charges are detonated by means of an ultra-high frequency (UHF) command system which operates on a dual-channel network to provide system redundancy. Dispersion of vehicle propellants is initiated by a selected combination of audio tones impressed on the UHF carrier which is transmitted from Cape Kennedy and several down-range stations.

The S-I and S-IV stages have separate and independent flight termination systems; however, the explosive charges in both systems are interconnected until S-I/S-IV stage separation occurs. This interconnection provides for simultaneous dispersion of the propellants in both stages regardless of which stage receives the flight termination signal.

1.3.1 Component Description - Major components of the flight termination system are: command transmitter, receiving antennas, command receiver, command controller, EBW firing unit, EBW detonator, safety and arming device, and primacord and shaped charges. These components are illustrated in figure 3-2 and described in the following paragraphs.

1.3.1.1 Command Transmitter. Command transmitters are provided in sets of three at Cape Kennedy and the down-range stations. Each set provides one transmitter for operation, one for standby, and one for spare. Each transmitter is equipped with an external audio coder to modulate the frequency modulated (FM) carrier with the sequence of tones necessary to initiate flight termination. The transmitters are also equipped with a power amplifier and broad-beam antenna array. The transmitter at Cape Kennedy is equipped, additionally, with a manually operated helix array that is connected directly to the output of the transmitter until a few seconds after liftoff. The helix array is a narrow-beam antenna that is visually aimed through a gunsight arrangement to follow the vehicle at liftoff. The transmitter output is switched from the helix antenna to the amplifier and broad-beam antenna a few seconds after liftoff to provide greater range for possible flight

termination command. The broad-beam antenna is manually positioned prior to liftoff and requires no adjustment during vehicle flight.

1.3.1.2 Receiving Antennas. Four command-receiver antennas are mounted on panels near the top of the S-I stage. Two are located above fin I and two are located above fin III.

Four command-receiver antennas are mounted on the S-IV forward interstage assembly at approximately 90-degree intervals.

1.3.1.3 Command Receiver . Four UHF receivers, two in the S-I stage and two in the S-IV stage, provide 100 percent redundancy in each stage. Since the two stages are also interconnected, this provides a 100 percent overall redundancy. Each command receiver unit has an audio decoder and a power regulator. Automatic gain control at the command receivers on the S-I and S-IV stages is monitored and telemetered to the ground for use in receiver performance determination.

1.3.1.4 Command Controllers . A command controller is connected to each command receiver and controls the command receiver and the associated EBW firing unit. Signals for control of the vehicle and supervisory indications are selected and distributed through this controller.

1.3.1.5 EBW Firing Unit. An EBW firing unit is connected to each EBW Detonator in the S-I and S-IV stages. A transistorized oscillator and transformer network in the unit steps up the 28-volt direct current input to a 2300 volt level. This voltage is then used to charge a one-microfarad capacitor. A flight termination signal from the range safety officer is then required to discharge the capacitor and explode the EBW detonator.

1.3.1.6 EBW Detonator. EBW detonators B509 and E352 each consists of a fine wire embedded in primer explosive and connected across two terminals. A gap in one lead provides an open circuit to prevent stray voltage from causing a malfunction of the EBW detonator. The 2300-volt discharge from the one-microfarad capacitor in the EBW firing unit arcs across the gap to fire the EBW detonator. The shock of this explosion ignites, the primer which detonates the primacord.

1.3.1.7 Safety and Arming Device. The S-I stage is provided with Safety and Arming Device B504. The corresponding unit on the S-IV stage is E303. These ground safety devices, which are controlled from the launch control center, isolate the EBW detonators from the primacord and thereby prevent inadvertent detonation of the primacord while the vehicle is on the launch pad.

1.3.1.8 Primacord and Shaped Charges. Primacord (pentaerythrite tetranitrate) and shaped charges are provided on the S-I stage to rupture the fuel and LOX tanks on command from the ground. Two lengths of Primacord, B505-1 and B505-2, circumscribe the S-I stage on the underside of the spider beam 45-degree fairing. Attached to Primacord B505-1 and B505-2 are two Primacord Assemblies B507-2 and four Primacord assemblies B507-3. Each primacord assembly contains a

linear shaped charge inside conduit that extends approximately 640 inches down the outside of each of the eight outer propellant tanks (F-1 through F-4, and O-1 through O-4). Primacord assembly B506 extends approximately 240 inches down the side of the center LOX tank (O-C). The entire explosive train is connected to EBW Detonators B509 by Primacord Adapter Assembly B508. Primacord and shaped charges are also provided on the S-IV stage to disperse S-IV propellant. The shaped charges used in the S-IV stage contain RDX (cyclotrimethlene trinitramine) explosive. Two Shaped Charge Assemblies, E304 and E309, are enclosed in a tunnel along the outside of the LH_2 tank. Aft Dome Harness E310 joins the LH_2 tank shaped charges with Shaped Charge Assembly E307 which encircles the bottom of the LOX tank. The entire explosive train is connected to EBW Detonators E352 by Forward Interstage Harness E311.

The S-I and S-IV stage explosive networks are joined by Aft Interstage Harness E312. Separation Blocks E305 and E306 break the interconnection at stage separation.

1.3.2 System Operation - Flight termination is initiated by the range safety officer if the vehicle deviates from the assigned mission and presents a hazardous condition. The flight termination propellant dispersion signals are sent by the command transmitter at Cape Kennedy and down-range stations to receiving antennas located on the S-I stage and on the S-IV stage forward interstage. These signals are then sent through an electronic network that demodulates, decodes and routes the signals as required to shut down the vehicle engines and detonate the explosive charges. The explosive charges rupture the propellant tanks and disperse and ignite the propellants. Ignition of the propellants in an unconfined space limits the resultant explosion to a fraction of the possible intensity.

The two-step flight termination sequence, arming and flight termination, is described in the following paragraphs.

1.3.2.1 Arming. Safety and Arming Devices B504 and E303 remain in the safe position mechanically and electrically until liftoff. At liftoff the umbilical lines disconnect and de-energize a relay in the command controller to complete the circuit between the command receiver and the EBW firing units, making it possible for the range safety officer to arm and activate the flight termination system at his discretion.

1.3.2.2 Flight Termination. The flight termination system in both the S-I and S-IV stages is armed and activated by a two-part FM signal from the ground. The arm portion of the signal causes the engines to shut down, the safety and arming devices to operate to the ARM position, and the capacitors in the EBW firing units to charge to 2300 volts. The activate, or second portion of the signal is then transmitted to cause the one-microfarad capacitor to discharge across the EBW detonator and thus detonate the explosives that rupture the propellant tanks.

The flight termination sequence is as follows:

a. The flight termination switch is closed in the launch control center

b. The command transmitter sends an FM, audio coded signal to the vehicle.

c. The receiving antennas transfer the signal to the command receivers.

d. The command receivers demodulate and decode the signal. The separated control signals are then fed to the command controllers.

e. The command controllers initiate engine cutoff through the flight computer and charge the capacitors in the EBW firing unit. (The capacitors require about 2.5 seconds to charge to 2300 volts).

f. A second signal then triggers the EBW firing units which explode EBW Detonators B509 and E352.

h. EBW Detonators B509 and E352 ignite Primacord B505, Primacord Adapter Assembly B508, and Explosive Harness Assemblies E310, E311, and E312. This, in turn, ignites Primacord Assemblies B506 and B507, and Shaped Charge Assemblies E304, E307, and F309. The primacord assemblies and shaped charges rupture the propellant tanks in both stages and disperse the propellants.

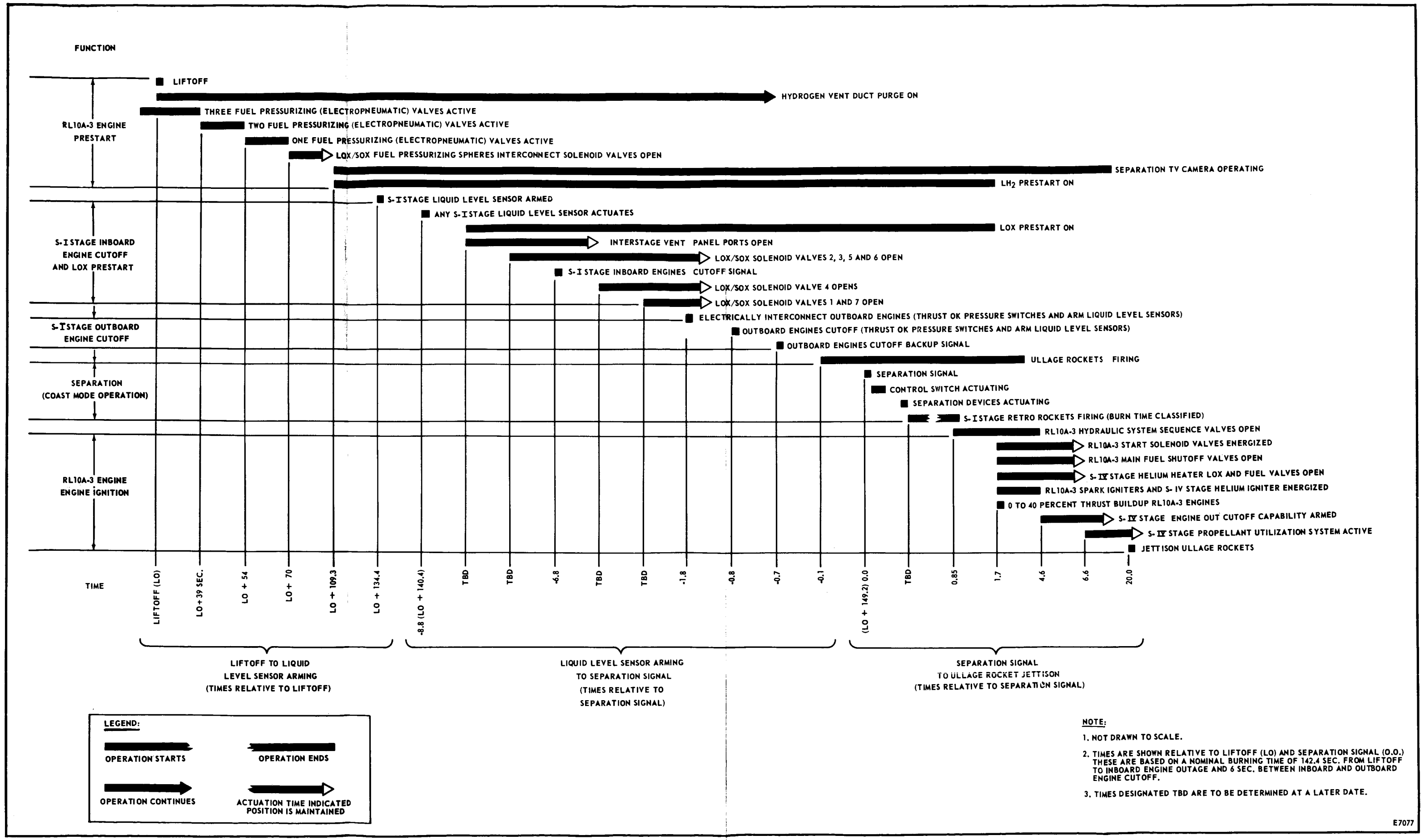

Figure 1-1. S-I Stage/S-IV Stage Separation Sequence

SECTION 2

INDEX OF FINDING NUMBERS

This section contains an alpha-numerical list, by finding numbers, of the separation and flight termination systems components. The finding numbers listed identify components on system schematic diagrams provided in section III. Additional columns in the index of finding numbers provide such pertinent information as component description and function, part number, and the supplier's name and part number. A break will occur in the alpha-numerical sequence of finding numbers when a component, or component series is part of another functional system.

The letter prefix on finding numbers identify components with either the launch complex or an area of the launch vehicle. The area associated with each prefix is noted below.

FINDING NUMBER PREFIX	DESIGNATED AREA
A	Ground support components
B	S-I stage components
E	S-IV stage components
G	Instrument Unit
H	Payload

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
B500-1	1	Retrorocket Motor Assembly	Solid propellant, stage Separation	Aerojet General Corp. P/N 3-311696	20C29899	11A32
B500-2	1	Retrorocket Motor Assembly	Solid propellant, stage Separation	Aerojet General Corp. P/N 3-311696	20C29899	11A33
B500-3	1	Retrorocket Motor Assembly	Solid propellant, stage Separation	Aerojet General Corp. P/N 3-311696	20C29899	11A34
B500-4	1	Retrorocket Motor Assembly	Solid propellant, stage Separation	Aerojet General Corp. P/N 3-311696	20C29899	11A35
B501	8	Initiator Assembly	Retrorocket ignition	Aerojet General Corp. Model No. AGX-2008 P/N 505850	20C29905	
B502 is not functionally applicable to this system.						
B503	4	Igniter Assembly	Retrorocket ignition	Aerojet General Corp. P/N 363897	20C29904	
B504	1	Safety and Arming Device	S-I stage flight termination	Douglas Aircraft Co. Inc. P/N 1A02446-1	10C11027	
B505-1	1	Primacord	50 grain/ft PETN, 357 in. length	Ensign Bickford Co.	10C11238-11	
B505-2	1	Primacord	50 grain/ft PETN, 412 in. length	Ensign Bickford Co.	10C11238-13	
B505-3	1	Primacord	50 grain/ft. PETN, 40 in. length	Ensign Bickford Co.	10C11238-15	
B506	1	Primacord Assembly	50 grain/ft PETN primacord and 100 grain/ft PETN linear shaped charge	Ensign Bickford Co.	10C11239-1	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
B507-1	2	Primacord Assembly	50 grain/ft PETN primacord and 100 grain/ft PETN linear shaped charge	Ensign Bickford Co.	10C11240-1	
B507-2	2	Primacord Assembly	50 grain/ft PETN primacord and 100 grain/ft PETN linear shaped charge	Ensign Bickford Co.	10C11240-3	
B507-3	4	Primacord Assembly	50 grain/ft PETN primacord and 100 grain/ft PETN linear shaped charge	Ensign Bickford Co.	10C11240-5	
B508	2	Primacord Adapter Assembly	60 grain/ft PETN primacord 60 in. length	Ensign Bickford Co.	10C11026	
B509	2	Detonator, EBW	1.40 ± 0.25 grain PETN; S-I stage flight termination	Douglas Aircraft Co. Inc. P/N 7865742-1	10C11028	
B510 through E289		are not functionally applicable to this system.				
E290	4	Rocket Motors, Ullage	4800 lb. max. thrust; solid propellant	Thiokol Chemical Corp. TX-280, P/N FR 36192		
E291	8	Initiator	Ullage rocket	Thiokol Chemical Corp. P/N TX-346		
E292	8	Nut, Frangible	1/2 in. 1d, spring loaded; Ullage rocket jettison	Douglas Aircraft Co. Inc. P/N 1A72620-1		
E293-1	2	Explosive Harness Assembly	Two leads per harness; Ullage rocket jettison	Douglas Aircraft Co. Inc. P/N 1A00773-507		
E293-2	2	Explosive Harness Assembly	Two leads per harness; Ullage rocket jettison	Douglas Aircraft Co. Inc. P/N 1A00773-509		
E294	4	Igniter	Ullage rocket	Thiokol Chemical Corp. P/N DR 37897		

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
E295 through E301 are not functionally applicable to this system.						
E302	4	Nut, Frangible	9/16 in. 1d, spring loaded; stage separation	Douglas Aircraft Co. Inc. P/N 1A72619-1		
E303	1	Safety and Arming Device	S-IV stage flight termination	Douglas Aircraft Co. Inc. P/N 1A02446-1		410A20
E304-1	1	Shaped Charge Assembly	100 grain/ft RDX, 57 in. length	Douglas Aircraft Co. Inc. P/N 3886337-501		
E304-2	1	Shaped Charge Assembly	100 grain/ft. RDX, 53.5 in. length	Douglas Aircraft Co. Inc. P/N 3886337-1		
E305	1	Separation Block Assembly	S-IV Stage flight termination	Douglas Aircraft Co. Inc. P/N 1A02315-1		
E306	1	Separation Block Assembly	S-IV Stage flight termination	Douglas Aircraft Co. Inc. P/N 4884325-1		
E307-1	2	Shaped Charge Assembly	100 grain/ft RDX, 50 in. length	Douglas Aircraft Co. Inc. P/N 3886334-501		
E307-2	1	Shaped Charge Assembly	100 grain/ft RDX, 50 in. length	Douglas Aircraft Co. Inc. P/N 3886333-501		
E308-1	6	Detonating Cord Assembly	PETN, 128.5 in., length, Vent panel release	Douglas Aicraft Co. Inc. P/N 4882928-1		
E308-2	2	Detonating Cord Assembly	PETN, 121.5 in. length, vent panel release	Douglas Aircraft Co. Inc. P/N 4882928-501		
E309-1	1	Shaped Charge Assembly	100 grain/ft RDX, 60.5 in. length	Douglas Aircraft Co. Inc. P/N 3886336-501		

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
E309-2	1	Shaped Charge Assembly	100 grain/ft. RDX, 64 in. length	Douglas Aircraft Co. Inc. P/N 3886336-1		
E310	1	Explosive Harness Assembly	60 grain/ft. PETN; aft dome	Douglas Aircraft Co. Inc. P/N 3886335-1		
E311	1	Explosive Harness Assembly	60 grain/ft. PETN, 160 in. length - 2 required; forward interstage	Douglas Aircraft Co. Inc. P/N 3886338-1		
E312	1	Explosive Harness Assembly	60 grain/ft. PETN; wt interstage	Douglas Aircraft Co. Inc. P/N 3886332-1		
F313	1	Explosive Harness Assembly	PETN, 658 in. length 2 required	Douglas Aircraft Co. Inc. P/N 3883012-503		
E314 through E349		are not functionally applicable to this system.				
E350	2	Detonator, EBW	1.40 (± 0.25) grain PETN; Ullage rocket jettison	Douglas Aircraft Co. Inc. P/N 7865742-1		
E351	2	Detonator, EBW	1.40 (± 0.25) grain PETN; Stage separation	Douglas Aircraft Co. Inc. P/N 7865742-1		
E352	2	Detonator, EBW	1.40 (± 0.25) grain PETN; S-IV stage flight termination	Douglas Aircraft Co. Inc. P/N 7865742-1		
E353	2	Detonator, EBW	1.40 (± 0.25) grain PETN; Vent panel release	Douglas Aircraft Co. Inc. P/N 7865742-1		

SECTION 3

MECHANICAL SCHEMATICS

This section contains mechanical schematics which reflect all of the components involved in the functional operation of the separation and flight termination systems.

For a definition of the mechanical symbols used, see MSFC-STD-162.

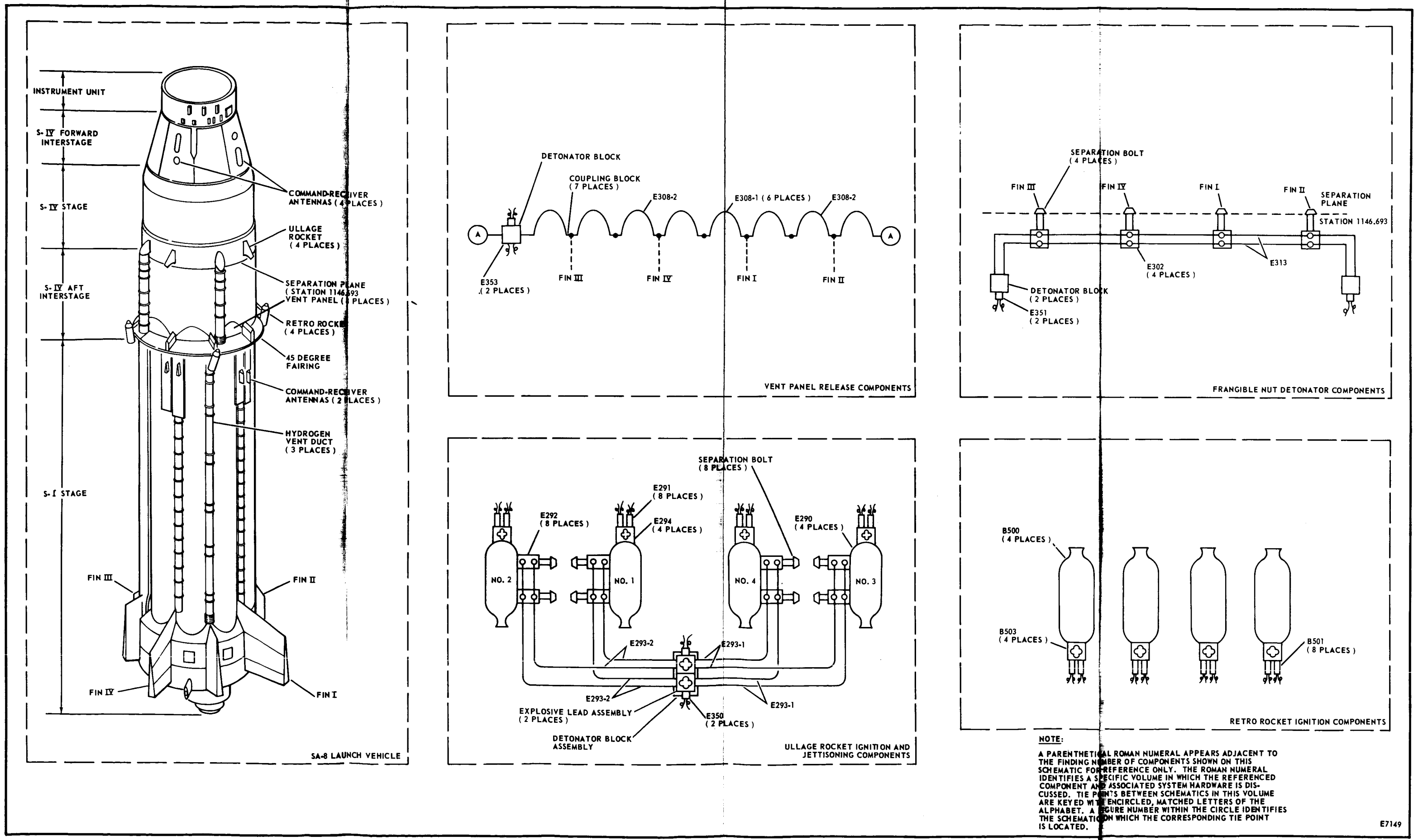

Figure 3-1. Launch Vehicle Separation Components

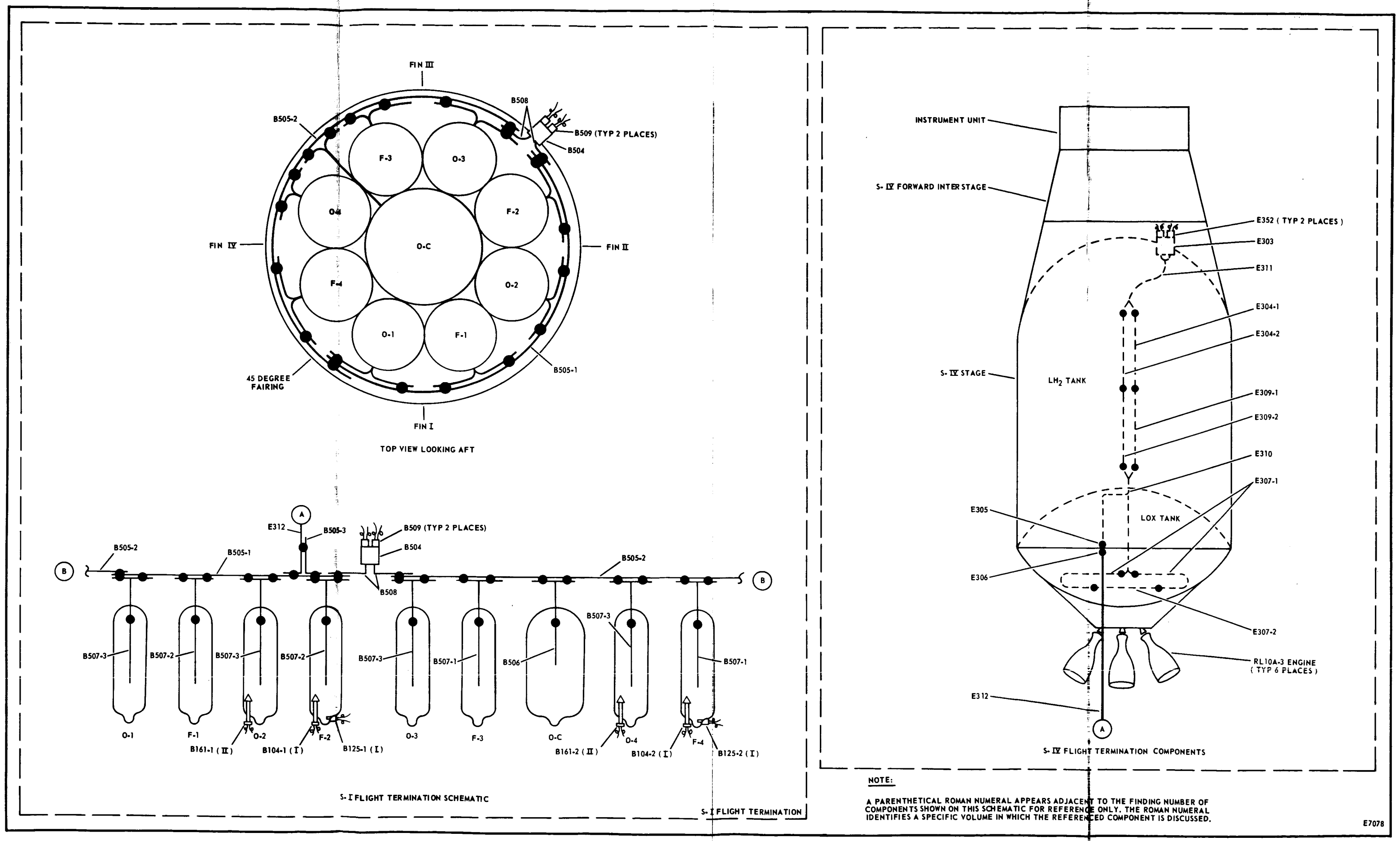

Figure 3-2. Launch Vehicle Flight Termination Components

APPENDIX A

LISTING OF LAUNCH VEHICLE SA-8 AND LAUNCH COMPLEX 37B VOLUMES

Volume	Title
I	RP-1 Fuel System
II	LOX System
III	LH_2 System
IV	Nitrogen and Helium Storage Facility
V	Pneumatic Distribution System
VI	Environmental Conditioning Systems
VII	Launch Pad Accessories
VIII	H-1 Engine and Hydraulic System
IX	RL10A-3 Engine and Hydraulic System
X	Separation and Flight Termination System