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TRAINING MANUAL

REVISION SUPPLEMENT

J-3 CPX SYSTEM

CONCOM PROGRAM

15 APRIL 1970

[redacted]

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

FOREWORD

This document consists of material required to up-date the J-3 CR System Training Manual, T3-7-100, for changes to J-3 payload systems since the date of original release. It is intended that distribution be limited to activities conducting an approved training program in the J-3 CR system. Due to the extensive and revealing nature of the contents, the manual requires safeguarding in strict accordance with the classification.

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

DESCRIPTION OF CHANGES

This section contains descriptions of the changes made to the J-3 CR systems since the publication date of the J-3 CR System Training Manual T3-7-100. The manual will not be revised or re-issued. Instead, selected copies will be rubber-stamped with a marker (☞) at points throughout the text where changes occur. Descriptions of changes are not written as complete replacement passages. They are simply statements of the need for updating and descriptions of the changes, which are numbered to correspond to the number of the manual page and paragraph which they revise and the system to which they apply.

Beginning with Agena 1654, extensive changes were made to the command system. The S-Band Beacon and the beacon-generated analog (ANA) commands were removed from the Agena. To preserve redundance the ANA commands were replaced with "SILO" commands with frequencies in the UHF band. In general, nomenclature, frequencies and functions of the existing UHF (UNCLE) commands remain unchanged. The method for designating ANA, UNCLE and SILO commands can be best described by an example:

ANA 14	(Used prior to 1654/CR-9)	} DISIC MODE SELECT
UNCLE 124	(ANA Cmd. No. + 110)	
SILO 324	(UNCLE Cmd.No.+ 200)	

Concurrently with the redesignation of ANA commands to SILO, the KIK-ZORRO 38 and 39 commands have been redesignated "KIK-SILO".

Since this change in nomenclature appears in so many places throughout the text, the changes will be marked at the point where they first appear in a paragraph; but written descriptions will not be provided.

The command function list for each payload system is issued under a separate report. For up-to-date nomenclature and definition of the SILO/UNCLE command system refer to the command function list for the payload designated.

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
A-3 A-2.0 1654 & Up	Beginning with vehicle 1654, the orbital mission was increased from 14 days to 20 days. This was made possible by a 3/4 speed orbital Programmer and additional batteries.

SUPPLEMENT TO THE TRAINING MANUAL [redacted]

Description of Changes (Continued)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
B-1 B-1.1d 1654 and Up	Delete reference to VHF Command System
B-2 Figure B-1 1654 and Up	Delete Bar between "Start BTL Steering" and "Agena Shutdown".
B-3 Figure B-2 1654 and Up	Substitute DMU Sequence Fig. B2 in Appendix FF.
B-5 B-2.2.1 1654 and Up.	The standardized Agena "D" has been replaced by an Agena manufactured specifically for the [redacted] Program. Any reference to the Agena "D" now means the [redacted] Agena. Delete the last sentence of the paragraph.
B-5 B-2.4 1654 and Up	Replace first sentence with: The [redacted] Agena is a satellite vehicle configured to perform the [redacted] Ascent and Orbit mission requirements. Factory to Launch Test Sequence is shown in Figure B-5 in Appendix FF.
B-5 B-2.5 1654 and Up	This paragraph is no longer applicable.
B-8 Figure B-5 1654 and Up	Figure B-5 has been revised to show the present manufacturing, assembly and test flow. See Appendix FF.
B-9 B-3.1 1654 and Up	Add reference to Figure B-4, and replace Fig. B-6 and B-7 with Figure B-6 in Appendix FF.
B-10, B-11 Figures B-6 and B-7 1654 and Up.	These figures are obsolete and replaced by Fig. B-6 in Appendix FF.
B-12 Figure B-8 1654 and Up	The baffle shown in the upper view is no longer applicable.

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
B-13 Para. B-3.2 1654 and Up	Delete "with baffles" and "with baffles installed".
B-13 Para. B-3.3 1654 and Up	Revise last sentence in first paragraph to read "The aft equipment rack provides mounting facilities for gas storage, solar array, drag-make-up rocket, research payloads, and other equipment items.
B-15 Para. B-4.1 1654 and Up	Agena propulsion now has an additional component system called the Drag Make-up System. See paragraph B-4.1.1.3 in Appendix FF.
B-16 Figure B-10 1654 and Up	Isolation Valves and Solid Propellant Starter [redacted] are not part of the current [redacted] Agena.
B-20 Para. 5.0 to 5.43 1654 and Up	This section describes an earlier version of the Agena guidance system. The present [redacted] Agena Guidance and Control subsystem is described in paragraph 5.0 in Appendix FF.
B-28 Figure B-15 1654 and Up	Delete the note concerning angular reference designations.
B-31 Figure B-17 1654 and Up	Refer to Fig. B-17 in Appendix FF for present pneumatic system configuration.
B-35 to B-41 Para. B-6.0 thru B-6.2.2 1655 and Up	This section describes an earlier version of the Agena electrical subsystem. Refer to Appendix FF, Section B- 6.0 for an up-to-date description of the [redacted] Agena electrical power system.
B-37 Table B-1 1655 and Up	Replace with Table B-1 in Appendix FF.
B-38 Table B-2 1655 and Up	Replace with Table B-2 in Appendix FF.
B-39 Figure B-19 1655 and Up	Replace with Figure B-19 in Appendix FF.

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
B-40 Figure B-20 1655 & Up	Delete Figure B-20 because it is not applicable to the present Agena
B-41 Para B-6.2.3 1655 and Up	Type X DC-DC connector has been removed from the Agena because the J3 Payload does not require regulated power.
B-42 Para B-6.2.4 1654 and Up	The ± 28 VDC signal conditioner is located on an independent terminal board assembly.
B-44 Para B-6.3 1654 and up	This paragraph is not applicable to the present [redacted] Agena.
B-44 Para B-6.3.1 1655 and Up	Battery options are discussed in Para 6.2.1.2 of the appendix. With the substitution of the solar array system for primary batteries the Agena payload capability has increased by approximately 450 lbs. The aft rack of the Agena is configured to support a variety of research payloads.
B-45, B-46 Para B-6.4.1 1654 and Up	Reference to O.S.F.G. should be changed to Yaw Programmer.
B-46 Para B-6.4.2.1 Table B-5 1655 and Up	Battery types 1C, 1D, and VI are no longer used by this program. Refer to Table B-5A in the appendix for battery characteristics of Type VI A.
B-48 Figure B-21 1655 and Up	Replace with Figure B-21 in Appendix FF which shows Solar Array System performance.
B-49 Para B-6.4.2.4a 1654 and Up	Reference to O.S.F.G. should be changed to Yaw Programmer.

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
B-51 Para B-7.2.1 1654 and Up	UHF Command Link has been replaced by the SGLE Command Link as described in Appendix FF.
B-52 Figure B-22 1654 and Up	This figure has been revised to reflect addition of SGLE equipment and location of the UNCLE equipment in the Agena forward equipment rack. See Figure 22 in Appendix FF.
B-53 Figure B-23 1654 and Up	UHF Command System has been deleted. Figure B-23 in the appendix shows the SILO and UNCLE Command Links and the two Telemetry Links.
B-55 Para B-7.2.1 1654 and Up	Refer to Appendix FF for a description of the SILO Command System, which has replaced the Super-1 (UHF) Command System.
B-57 Figure B-25 1654 and Up	This figure is replaced by Figure B-23 in Appendix FF.
B-58 Figure B-26 1654 and Up	Figure B-26 is obsolete and is no longer applicable. Refer to Figure B-26 in Appendix FF.
B-59 Figure B-27 1654 and Up	Figure B-27 is deleted.
B-62 Para B-7.2.2.1 1654 and Up	Command duration is 16 ± 3.0 seconds. Reference to 10 seconds nominal should read 16 seconds nominal. Reference to Analog Commands should be RF Commands because both SILO and UNCLE Commands are applicable. Item (a) Orbital Programmer speed has been reduced from 9 to 6.75 inches per orbit. Item (b) Period is 20 days and approximately 325 orbits.

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SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
B-63 Figure B-29 1654 and Up	Analog 1, 2, 3 and 7 Commands are replaced by: SILO 311/UNCLE 111 SILO 312/UNCLE 112 SILO 313/UNCLE 113 SILO 317/UNCLE 117 Beacon ON/OFF functions should read SILO/RCVR Demod and Decoder
B-64 Para B-7.2.3.1 - (2) 1654 and Up	KIK-Zeke is changed to KIK-UNCLE. Insert the word "SILO" before UHF. Delete reference to Figure B-30.
B-64 Para B-7.2.3.1.1 1654 and Up	Analog Command 4 is replaced by SILO 314/ UNCLE 114. Analog Command 5 is replaced by SILO 135/ UNCLE 115. Command designator KIK-Zorro is replaced by KIK-SILO.
B-65 Para B-7.2.3.1.2 1654 and Up	Command designator KIK-Zorro is replaced by KIK-SILO.
B-66 Figure B-30 1654 and Up	This figure is obsolete and is deleted.
B-67 Figure B-31 1654 and Up	This figure is deleted since S-Band and Analog System has been replaced.
B-69 Figure B-33	Figure B-33 is replaced by Figure B-33 in Appendix FF.
B-70 Table B-8 1654 and Up	Refer to Table 8 in Appendix FF for an up-to-date listing of the Recovery Timer Sequence of Events.
B-72 Figure B-34 1654 and Up	Figure B-34 is replaced by Figure B-33 in Appendix FF.

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
B-74 Para B-7.2.3.4 (a) 1654 and Up.	Mode selection is accomplished by a [illegible] UNCLE Command. Secure Command is designated KIK-UNCLE (Zeke Command System has been deleted).
B-74 Para B-7.2.3.4 (a) 1654 and Up	In Mode Select listing the "L/B Pneu. OFF" function is a backup. In the Execute function's change the 3rd item "Unsecure" to Secure.
B-75 Table B-9 1654 and Up	Refer to Appendix FF for an up-to-date Listing of Lifeboat Sequence of Events.
B-75 Para 7-7.2.3.4 (b) 1654 and Up	Mode selection is accomplished by an Unsecure UNCLE Command.
B-76 Para 7-7.2.3.4 (b) 1654 and Up	Under Mode Select Listing add: (1) Power ON to Magnetometer and Flight Control Electronics (2) Initiate A Sequence Change ZEKE to UNCLE Last item change Unsecure to Secure
B-76 Para -7.2.4 (e) 1654 and Up	The function designated "Link I Telemeter Signal" is now derived from both the Agena Link I or Link II. The signal is now designated " Link I/ Link II Telemeter Signal."
B-78 Para B-7.2.4.4 1654 and Up	KIK-Zorro and KIK-Zeke Command designators are now KIK-SILO and KIK-UNCLE.
B-78 Para B-7.2.4.5 1654 and Up	Link I Telemeter Signal is changed to Link I/II Telemeter Signal. Link II ON/OFF Brush Commands will also provide or remove signal at the payload interface.

[redacted]

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
B-79 Para B-7.2.4.5 1654 and Up	(a) Link II Tele[illegible] will also be [illegible] a function of L/[illegible] Unsecure Co[illegible]nds Ul[illegible] (c) Change VHF to UHF and MIH-Zebra 32 to MIH-UNCLE 32.
B-80 Para B-8.2.1.3 1654 and Up	This paragraph is no longer applicable since R/C Commands will operated Link II Telemeter.
B-80, B-81 Para B-8.2.1.4 (b) 1655 and Up	Item (b) should be deleted because gas valve monitors have been removed from the Agena/Payload Interface.

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
D-4 Fig. D-3 CR-6 & Up	The no-gold paint pattern shown in Figure D-3 is not exactly as the pattern was actually developed. Mystik aluminum tape is used to cover all of the areas shown covered by white silicon elastomer paint and Mylar aluminum tape. Also no staples are used to fasten the aluminized Mylar thermal shielding.
D-5 D-3.1.2 CR-6 & Up	Modifying the no-gold paint pattern shown in Figure D-3 results in a different distribution of thermal control surfaces. The exterior surface consists of black silicone paint on the top and bottom quadrants and Mystik aluminum tape on the entire surfaces of the sides.
D-8 D-5.1 CR-6 & Up	If a modification of the standard no-gold paint pattern is required, this is done by adding Mystik aluminum tape to the upper quandrant as required. Add following paragraph: At orbital temperatures, the black paint has a net cooling effect, while the aluminum tape has a net heating effect on the structure. Addition of tape over the black paint on the top quandrant reduces the black area and increases the aluminum area. This raises orbital average temperatures. The system is thus "tuned" by varying the area of tape added.
E-4 Fig. E-3 CR-5 & Up	Two changes, which affect Figure E-3, have been made. Accelerometers were deleted. Spare pins in Auxiliary Connector AJ-19X, not shown in Figure E-3, were activated to carry commands from Agena to the Command Box.
E-6 E-3.1.3 1654 & Up	The Agena S-Band beacon and commands were eliminated from the Agena beginning with vehicle 1654. The change to the redundant SILO/UNCLE command system eliminated the ANA commands.
E-9 E-3.1.4g CR-5 & Up	Changes in the tape recording system were made for CR-5 and Up. Agena Thrust (Gas Jets) is no longer monitored, and clock sync pulse stretchers are no longer used.
E-1 E-3.1 1655 and Up	T3-9-006 replaces T3-5-023 for Agena to AP Payload Interface Specification.

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
F-1, F-2 Table F-1 CR-6 and Up	The flight of the CR-5 system was the only flight using UTB film exclusively. No further flights with UTB film are planned.
F-5 F-3.0 CR-6 and Up	Delete reference to 3.0 mil (UTB) film.
F-6 F-3.1 CR-8 and Up	With the development of the new supply servo control system, low voltages are now developed for both the camera drive and the supply servos.
F-11 F-3.4 All Systems	The optical encoder subsystem is no longer applicable. It was used on the CR-4 system only.
F-13, F-14 F-3.5 CR-8 and Up	The supply cassette control system has been changed to a servo feedback system for each panoramic camera. A torque motor, geared to each spool, is driven by a servo amplifier which receives its control signal from a tension sensing dancer-roller assembly at the output of the cassette. Thus a constant reverse tension is applied to the film entering the camera to prevent formation of slack loops. To prevent spool rotation during launch and non-operational periods, brakes are incorporated in the spool drive mechanism.
F-20 F-3.10.3.1 FR-8 and Up	In systems provided with the supply cassette servo control system, the supply brakes are ON, preventing excessive spool rotation, during launch. The brake method of caging the supply spool replaces the method of supplying film tension by the backward pulling of the torque motor.
F-21 F-3.10.3.3 CR-6 and Up	The time delay period for instrument shut down has been changed. The supply and take-up motors remain energized for an additional twenty seconds to maintain system tension, after which the system is fully shut down and is in the Stand-by mode.
F-22 F-3.10.3.4 All Systems	For clarification: at the end of the five-second period, the camera drive motor, the supply servo and take-up B spool torque motors are energized.

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
F-23, F-24, F-25, F-26, F-27, F-28 F-4.0 CR-6 and Up	The changes in time periods affect the curves on Figures F-7 thru F-11. Corrected figures are included in Appendix FF.
F-29 F-5.0 CR-6 and Up	When the DSR command subsystem was added, it became necessary to rearrange the commutator point assignments of a number of CR instrument monitors. Because of this rearrangement and a need to change the nomenclature of several monitor functions, Table F-2 has been revised and is included in Appendix FF of this supplement. For specific T/M point assignments and a listing of redundant monitors not shown in Table F-2, refer to Addendum A to Telemetry Schedule T3-7-004 for the system under consideration.
F-32 F-6.0 1655 and Up	T3-9-006 replaces T3-5-023 for Agena to AP Interface Specification.
H-4 H-3.1.1 CR-6 and Up	Command UHF 101 has been redesignated SILO 301/UNCLE 101 Panoramic Camera Exposure Control. The description of the command function is correct. Command UHF 102 has been reassigned to DSR use. Panoramic camera slit width fail-safe control is accomplished by SILO 326/UNCLE 126 which places either instrument in the fail safe position while the other instrument is in automatic control or one of the fixed slit positions. SILO 326/UNCLE 126 only effects positions 6 through 10 of the stepper switch.
H-4, H-6 H-3.1.1, H-3.1.3 CR-6 and Up	The 1/250 second exposure has been disabled and not in use in later flights.
H-9 Figure H-4 CR-6 and Up	Exposure Control Delay is accomplished by dual command inputs, SILO 305/UNCLE 105, to Timer #1. SILO 305 is the primary command and UNCLE (UHF) 105 is the back-up
H-11 Figure H-5 CR-6 and Up	Same as comment on Fugure H-4.

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
H-12 Figure H-6 CR-6 and Up	Primary SILO commands used in combination with back-up UNCLE (UHF) commands should be indicated in the figure as follows: SILO 301/UNCLE 101 UHF 102 is SILO 326/UNCLE 126 SILO 305/UNCLE 105
I-1 Table I-1 All Systems	Terrain camera lens aperture has been changed to f/6.3 for some systems. Apertures used are as follows: CR-1 f: 4.5 CR-2 f: 4.5 CR-3 f: 6.3 CR-4 f: 4.5 CR-5 (No DISIC installed) CR-6 and Up f: 6.3
I-2 Table I-1 CR-7 and Up	Cycle period of Stellar Camera is now the same as that of the Terrain Camera.
I-2 Table I-1 CR-7 and Up	Total capacity of the terrain camera has been increased from 2000 feet to 2200 feet.
I-3 Table I-3 CR-7 and Up	One of four terrain cycling periods (9.375, 12.500, 15.675 or 18.75 seconds per cycle) can be selected prior to flight.
I-6 I-3.0 All Systems	The aperture of the Ikogen lens is f: 6.3. That of the Ikotar lens is f: 2.8.
I-8 I-3.1 CR-7 and Up	The supply cassette film load has been increased to 2200 feet.
I-8 I-3.3 CR-7 and Up	The take-up spool capacity has been increased to 1100 feet for each spool.

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
I-11 I-4.1 CR-6 & Up	DISIC Operation has changed with respect to operating modes and cycle periods. The following description shall be substituted for the first sub-paragraph of paragraph I-4.1: "The DISIC has two modes of operation, slave and independent. When the DISIC is operating in the slave mode, it is operated in conjunction with the pan instruments. In the independent mode, the DISIC operates independent of the pan instruments as a mapping camera. In both the slave and independent modes the terrain and stellar cameras have a capability for four cycle periods of 9.375, 12.50, 15.675 and 18.75 seconds. In practice it has been customary to use only the 9.375 seconds period."
I-13 I-4.3.3	The number of frames exposed during panoramic operation have been changed. Change 18 to 3 and nine to 3.

[redacted]

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
K-3 K-3.3 CR-6 & Up	Add the following: The dual range PMU has the same basic part number as the double bottle, single range unit. The dash number that creates the dual range calls for a different hole size at orifice #1 and a different control unit.
K-3 K-4.1 CR-6 & Up	Differences in the control unit for the pulsed PMU may be seen in Figure K-2, of the original document and Figure K-2 of Appendix FF. The Agastat Timer has been replaced by a latching relay and a time delay circuit. The time delay circuit controls the fast build-up interval only. Pulse timers are controlled by two timers in the Transfer Box. Two views of the assembled PMU, 2 bottle unit are shown in Figure K-3, Appendix FF. Orifice #1 will flow when Valve #1 is open. Orifice #2 will flow when Valve #1 and Valve #2 are both open. Orifice #1 is sized to maintain the lowest of the dual ranges. Orifice #2 is sized to give the desired pressure rise time. The dual range PMU may be operated in 2 steady state modes. 1) Orifice #1 only 2) Orifice #1 plus orifice #2 pulsed on and off. In either mode, orifice #2 may be timed on for fast build-up, at the conclusion of which, it will shut off or begin to pulse. Three timers control the initial fast build-up time and the "ON" and "OFF" pulse time. The nominal cycle rate is .5 H_z. Therefore, if T_1 is the "ON" time 2-T_1 is the "OFF" time. Normally T_1 is between .2 and .5 seconds, however, there is design flexibility to set the "ON" pulse or the "OFF" pulse to approximately 2 seconds, i.e. orifice #2 is either disabled, or is on for the full instrument operate period.

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
K-4 Table K-1 CR-8 & Up	The surge orifice is changed from .040 dia. to .046 dia.
K-4 Table K-1 CR-6 thru 9 CR-12 & Up	The sustaining orifice is changed from .020 dia. to .011 dia. After evaluation of CR-10 and 11 flights, flown with the .020 dia. size, the orifice size may be changed back to .020 dia.
K-8 Figure K-2 CR-6 and Up	Replace Figure K-2 by Figure K-2 in Appendix FF.
K-9 Figure K-3 CR-5 and Up	Replace Figure K-3 by Figure K-3 in Appendix FF.

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
L-1 L-2.0 CR-6 & Up	Stepper Switches have been replaced in the Command Box by a digital storage register in systems with a DSR Command Subsystem.
L-1 L-3.1.1.1 1654 & Up	Installation of the 3/4 speed orbital programmer results in changes in values of tape speed, brush contact time and event interval. Approximate values can be obtained by adjusting the figures to a ratio of 4/3. Values of time - related functions must be adjusted by this ratio throughout the text.
L-2 L-3.1.1.2 1654 & Up	The values of pulse duration and OFF interval have been changed as follows: pulse duration are now 225 to 475 milliseconds; and OFF interval is now from 0.7 to 0.9 seconds, except for SILO 302/ UNCLE 102 which is exempt from this time limit. Delete the last sentence of the first sub-paragraph. Replace the second sub-paragraph with: Secure real time commands (RTC's), may be initiated only once during an acquisition and are thereafter disabled. The interface electrical characteristics are +24 VDC unregulated with a maximum current of 2 amps with a duration from one second minimum to 15 minutes. RTC KIK-SILO 38 is used to accomplish early main A to B Transfer function. RTC KIK-SILO 39 is used to accomplish early DISIC A to B Transfer function. Add a third sub paragraph as follows: Both the unsecure and the secure RTC's appear at the Agena/Payload interface as +24 VDC signals. The vehicle-borne components of the tracking, telemetry and command subsystem, consisting of transmitters, receivers, decoders and programmers are contained within the Agena. Real-time commands are transmitted to the Agena by the SGLE (Space Ground Link Equipment). The SGLE is an integrated tracking, telemetry and Command System. The system is integrated in the sense that all tracking and command data are multiplexed onto a single radio frequency carrier of 1.791 GH_z for transmission to the vehicle. Similarly all telemetry and tracking data are multiplexed onto a single carrier of 2.237 GH_z for transmission to the ground station.

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
L3 L3.1.13 1654 & Up	The H-Timer is synonymous with Orbital Programmer and should be changed where ever referenced as H-Timer in text.
L3 L3.1.1.3.1 1654 & Up	Analog 10/UNCLE 120 is replaced by SILO 320/UNCLE 120 designation.
L5 L3.1.1.3.1 1654 & Up	Uncle 109 Command is SILO 309/UNCLE 109. Analog 9/UNCLE 119 is replaced by SILO 319/UNCLE 119.
L6 L3.1.1.3.2 1654 & Up	Analog 6 UNCLE 116 is changed to SILO 316/UNCLE 116. Analog 8/UNCLE 118 is SILO 318/UNCLE 118.
L7 L3.1.2 1654 & Up	Change KIK-ZORRO 38 and 39 to KIK-SILO 38 and 39. Wherever KIK-ZORRO is noted in text change the nomenclature to KIK-SILO.
L7, L-10, L-11 L-3.1.3 Through L-3.1.3.5 1654 & Up	These paragraphs are applicable to CR-1 through CR-5. Systems CR-6 and up are controlled by a digital storage register command system. The manner in which real time and stored program commands are processed by the DSR to control the panoramic camera is described in paragraph L-3.1.1.3 and Section B.
L8 & L9 Figures L1 & L2 1654 & Up	These figures applicable to CR-1 through CR-5 only.
L-12 3.1.4 CR-10 & Up	Revise the last paragraph to read: "The CR operate signal is used to control several functions as follows: (a) Clock Serial Interrogate Commands from the PCM. (b) Switches +24 VDC Unreg for TLM enable. (c) Operates either CR instrument. (d) Starts 17.5 second delay circuit to inhibit additional brush actuation (Brush bounce filter). (e) Operate DISIC Instrument, if DISIC is not inhibited by SILO 307/UNCLE 107. (f) Provide power to SLP Conditioner. (g) Operate PMU, if PMU is not inhibited by Silo 310/UNCLE 110.

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

Description of Changes (Cont'd)

PAGE PARA EFFECTIVITY	DESCRIPTION
L-12 (cont'd)	(h) Operate SRV Tape Recorder. (i) Provides +24 VDC unreg power for Exposure Control functions.
L-12 L-3.1.1 1654 and Up	ANA-14/UHF-124 is replaced by SILO 324/UNCLE 124 Command. In the second paragraph change the last sentence to read: "The mode 1 command sent to DISIC is derived from the CR operate command generating the DISIC data head logic." In third paragraph change UHF-107 command to SILO 307/UNCLE 107 command.
L-13 Figure L-3 1654 and Up	References ANA 14/UHF 124 is changed to SILO 324/ UNCLE 124 and UHF 107 is SILO 307/UNCLE 107.
L-14 Figure L-4 CR-6 & Up	Delete this figure refer to system schematics for DISIC Camera Control.
L-17 L-6.0 1655 & Up	Delete list of reference documents and replace by latest issue of following documents: T3-9-006 [redacted] Agena to AP Interface T3-5-021 DISIC to AP Interface T3-5-019 CR to AP Interface T3-5-020 -3 SRV to AP Interface T33-3001 Payload System Functional Schematics
M-2 M-3.0 1655 and Up	Where batteries are stated in first paragraph, add "and Solar Array".
M-3 M-4.0 1654 and Up	Beginning with vehicle 1654, there have been four changes which in turn cause changes in the amount of power consumed. These are: (1) Change to 20-day mission (2) Change to 3/4 speed Orbital Programmer (3) Addition of solar array panels (4) Variations in the number of batteries carried.
M-4 Table M-2 1654 and Up	The allowance of these items has changed from flight to flight resulting in variations in the amount of power

GROUP 1

EXCLUDED FROM AUTOMATIC [redacted]

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

Description of Changes (Cont'd)

M-4 - continued from previous page:

consumed. Values in the table are subject to change for each system.

M-9
Figure M-5
1654 and Up

The four items listed in the description for Items M-3 and M-4 above also affect the curves shown in Figure M-5. Addition of the solar array panels results in a more gradual drop off of terminal voltage after depletion of rated capacity.

M-10
Figure M-6
1655 and Up

This figure is for earlier versions of the Agena and is obsolete.

N-2
N-1.1
CR-6 and Up

"Clock sync pulse stretching" was term accomplished on CR-1 to 4 only. A more appropriate time which would be applicable to all J-3 systems would have been "Clock sync pulse event correlation".

N-2
N-2.0
CR-6 and Up

It is particularly important to refer to the Command Function List, Addendum A of T3-7-024 and the Telemetry schedule, Addendum A of T3-7-004 for each vehicle system for individual function nomenclature and monitor point assignments. Tables N-1 and N-2 are applicable to CR-1 thru 5 systems only. For later systems, to accommodate the DSR Command System and to provide better redundancy of operational control and monitoring, a significant number of changes have been made.

N-4
N-3.0
1654 and Up

Delete and replace the second paragraph with the following paragraph.

Link I consists of a coherent phase locked and crystal controlled two watt UHF-PM transmitter with the carrier modulated by a composite FM signal. The composite signal is derived from the baseband assembly unit which combines all subcarrier information from the IRIG voltage controlled oscillator (VCO) and frequency modulates and amplifies it with a 1.7 mhz VCO and power amplifier. Modulating the PM transmitter carrier with the FM composite signal results in a PM/FM frequency division telemetry signal. The VCO's require a 0 to 5 volt input signal for which the carrier is deviated by ± 7.5 percent from the center frequency.

N-9
N-3.5
All Systems

A more appropriate term for "analog to digital multiplexer" and electronic commutator would be "Pulse Code Modulation (PCM) unit".

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
N-9 N-3.6 CR-5 and Up	See comment above for page N-2, paragraph N-1.1 re: sync pulse stretcher. Replace remainder of paragraph beginning with "The duration of the Sync ....." with "Time occurrences of sync pulse events is marked by the PCM digital data bit stream by using digital words which indicate the sync pulse which has occurred"
N-10 N-3.7 CR-6 and Up	Replace words "transmitted via Channel 18, Link I and and also used for digital tape recording" with "digitized and recorded on the digital tape recorder".
N-10 N-3.8 CR-6 and Up	Provisions of Continuous Channel Enable have been changed. SPC 17 has been reassigned to another function, and SILO 327/UNCLE 127 Operational/Diagnostic Data Select has been added. For a description of the SILO 327/UNCLE 127 function see Addendum A of Specification T3-7-024.
N-12 N-3.10 CR-5 and Up	After the flights of CR-1 through CR-4 the accelerometer instrumentation was removed.
O-1 O-2.1 All Systems	Use of the digital instrumentation subsystem has been extended to all systems.
O-1 O-2.1 1655 and Up	Agena gas valves are no longer monitored by the tape recorder. The gas valve monitoring instrumentation is now used for Instrument Diagnostic Functions.
O-3 Table O-1 All Systems	The DCS number for the Pulse Code Modulation Unit should be T3-6-051.
O-3 Table O-1 CR-5, 9, 10	Drawing number of Electronic Commutation Unit is now T33-5148. Drawing number of PCM Unit is now T33-5147.
O-3 Table O-1 CR-8, 11 and Up	Drawing number of Electronic Commutator Unit is now T33-5166. Drawing number of PCM Unit is now T33-5149.

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
0-4 0-3.1 CR-5 and Up	The description of Digital Data #2 channel is no longer applicable. For CR-5 and Up #2 channel is redundant to #1 channel and handles the same data as described for #1 channel.
0-5 Figure 0-1 CR-5 and Up	The circuit of the Tape Recorder Subsystem shown in Figure 0-1 has been modified as follows: DRCG Sync outputs 1 and 2 go directly to the A/D Multiplexer (PCM unit) instead of through the 350 and 650 MS one shots, which have been eliminated.
0-5 Figure 0-1 CR-5 and Up	A DRCG Sync Output No. 3 has been added. No. 3 Output goes directly to the A/D Multiplexer. DRCG Serial Word Output goes to channel #2 only. The 6 Agena Gas Jet Monitors input to channels 3-8, 11-16 have been replaced by Instrument Diagnostic Functions to channels 3-8, 11-16 and 1. Relay K-3, with operating commands "A" T/M and Beacon ON, "B" T/M and Beacon ON, and "B" T/R Reverse Playback commands, has been eliminated. The capacitor across the resistor to Unreg. Return has been eliminated. Unreg. Return, symbol  , should be T/M Return, symbol  . With the elimination of Relay K-3 Digital Clock Sync goes directly to the Tape Recorder. "Mode A" of Mode A Record Command has been eliminated.
0-6 0-3.1 CR-5 and Up	Thirteen, not twelve, of the 16 PCM analog input channels contain instrument diagnostic date, not six gas jet monitors. The gas jet monitors have been deleted.
0-12 0-3.5 CR-5 and Up	Comments above for page 0-6, paragraph 0-3.1 apply.
0-14 0-3.6 CR-5 and Up	The description of Digital Data #2 channel is no longer applicable. See comments above for page 0-4, paragraph 0-3.1.

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

Description Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
Q-12 Q-3.2.1.1 All Systems	Since publication of the manual it has been established that the values of a number of items or functions require revision. These values appear at various places throughout the section. A marker has been placed on the line in the text on which a value requiring change appears. Each change will be noted in the manner in which the change in this paragraph is noted:
	Change 20 to 30
Q-12 Q-3.2.1.2 All Systems	Change RV to SRV
	Delete stainless
	Change 3000 to 3200
	Change 0.65 to 0.75
	Change 39 to 45
Q-14 Q-3.2.1.2 All Systems	Change 90 to 60
	Change 2400 to 2600
	Change RV to SRV
	Change 8 to 10
Q-16 Q-3.2.1.3 All Systems	Change 5 to 6
Q-18 Q-3.2.1.3 All Systems	Change the first sentences in sub-paragraph f to read:
	"The backup timer. - An electronic timer initiates a Thrust Cone Separate backup signal at 180 seconds after Arm and a Destruct command in the event a malfunction prevents successful re-entry prior to 1500 seconds after Arm command."
	Change 225 to 235

[redacted]

SUPPLEMENT TO THE TRAINING MANUAL [redacted]

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
Q-19 Q-3.2.1.3 All Systems	Change 5 to 30 Change to listing of recovery events to read: (1) Flashing light energized (2) Ejection piston pyro-actuated (3) Parachute sequence mechanically actuated. Delete event (4) of the sequence. The Backup Timer is energized by Arm signal. Replace subparagraph j with; "The inertia switch module. - Comprised of a bank of four viscous damped 3g inertia switches, two of which must operate (see Figure R-10). The purpose of these switches is to sense entry into the atmosphere. The inertia switches begin to sense the g-load at an altitude of 350,000 feet. The re-entry dynamics properties, as sensed by the inertia switches, trigger the recovery programmer."
Q-21 Q-3.2.3.2 All Systems	Change 150° to 110° Change 300° to 180°
Q-22 Q-3.2.5 All Systems	Change "fiberglas" to "metal and fiberglas."
R-1 R-1-0 CR-5 & Up	Recording of gas jet data has been replaced with instrument diagnostic data.
R-12 Table R-1 All Systems	Time of occurrance of SV/SRV mechanical separation is T_o + 1 not T_o + (later).

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
T-8 T-3.6.3.2 All Systems	All CR systems are given light load tests as described. CR-1 through CR-4 were used to develop and refine the test procedures.
T-10 T-3.7.6 All Systems	Add the following sub-paragraph: Before loading for shipment the payload is purged with nitrogen for 30 minutes. A Nitrogen Purge Valve is provided in the structure for this purpose.
T-10 T-3.8.1 All Systems	Add the following sub-paragraph: After completion of the Pre-Mate Receiving Inspection and checkout and immediately before the payload is transported to the launch pad, the structure is again purged with nitrogen for 30 minutes.
U-25 U-2.8 CR-6 and Up	Add Paragraph 2.8 as follows: An additional item of checkout equipment has been developed to check out the Digital Storage Register. This item is the DSR Checkout Console, T18-840. It was developed to test the DSR during Manufacturing Assurance Tests. It will also be used to test the DSR type Command Box in Components Test and the DSR type Command Subsystem during Systems Test. See Section L for a discussion of the DSR Command Subsystem. The console is a single bay, caster mounted enclosure about five feet high, with a sloping face. It contains a control panel, storage register, power supplies, and a patch board. During DSR checkout, the console simulates the function which the Agena vehicle performs in flight. It operates the DSR or the command subsystem in four basic modes: write, shift, T/M, and idle. Write mode is initiated by a switchlight on the control panel representing SILO 309/UNCLE 109 "Load Enable" command. This command clears the memory and output register enabling it to be filled sequentially with 32 5-bit data words in response to 32 "Write" commands which represent SILO 302/UNCLE 102 "Write" command. Both the "Load Enable" and the "Write" commands originate in normal flight from the Decoder Type 22 in the Agena vehicle. During test they can be simulated manually with a switchlight (Load Enable) and a switch matric of 32 sets of six toggle switches (Write).

SUPPLEMENT TO THE TRAINING MANUAL [redacted]

Description of Changes (Cont'd)

PAGE
PARAGRAPH
EFFECTIVITY

U-25
U-2.8
CR-6 & Up
(cont'd)

DESCRIPTION

Shift mode is initiated by a switchlight on the control panel. One stored word is dumped by each shift command. When all stored words have been dumped sequentially and read out, an all zero word is read out to indicate that the storage register has been emptied.

With 32 words stored and "load enable" still present, the DSR goes automatically into TM mode and remains in TM mode until power is removed. Contents of the memory can be read out serially as 5- bit words on the console display lamps. An error can be detected by comparing the readout with the word stored.

In idle mode the contents of the memory remains intact, with no conumption of electrical power. Idle mode is established by removal of power.

TOP SECRET

[redacted]

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

Description of Changes (Cont'd)

PAGE PARAGRAPH EFFECTIVITY	DESCRIPTION
AA-3 AA-1.8 All Flights	Add Paragraph AA-1.8 as follows: In 1968, eight J system flights were made. Of these, five were J-1 systems; and three were J-3 systems. Each flight carried two capsules making a total of sixteen. All capsules were recovered for a 100% recovery record. In 1969, six J system flights were made. Of these, three were J-1 systems; and three were J-3 systems. Each flight carried two capsules making a total of twelve. All capsules were recovered for a 100% recovery record.
BB-3 BB-1.2 CR-6 and Up	Add sub-paragraph o. as follows: J-3 Payload systems beginning with CR-6 have been equipped with a DSR command subsystem. For a description of this subsystem, see Section L.
DD-1.3 APP DD CR-6 and Up	Additions to the abbreviation list should be made as follows: DSR — Digital Storage Register SILO — Real Time Command, UHF UNCLE — Real Time Command, UHF
CC-1 Addendum A	The Command Function List noted in Appendix CC covered CR-1 through CR-5. For an up-to-date Command Function List, refer to the system under consideration.

[redacted]

SUPPLEMENT TO [illegible] MANUAL

APPENDIX FF

[redacted]

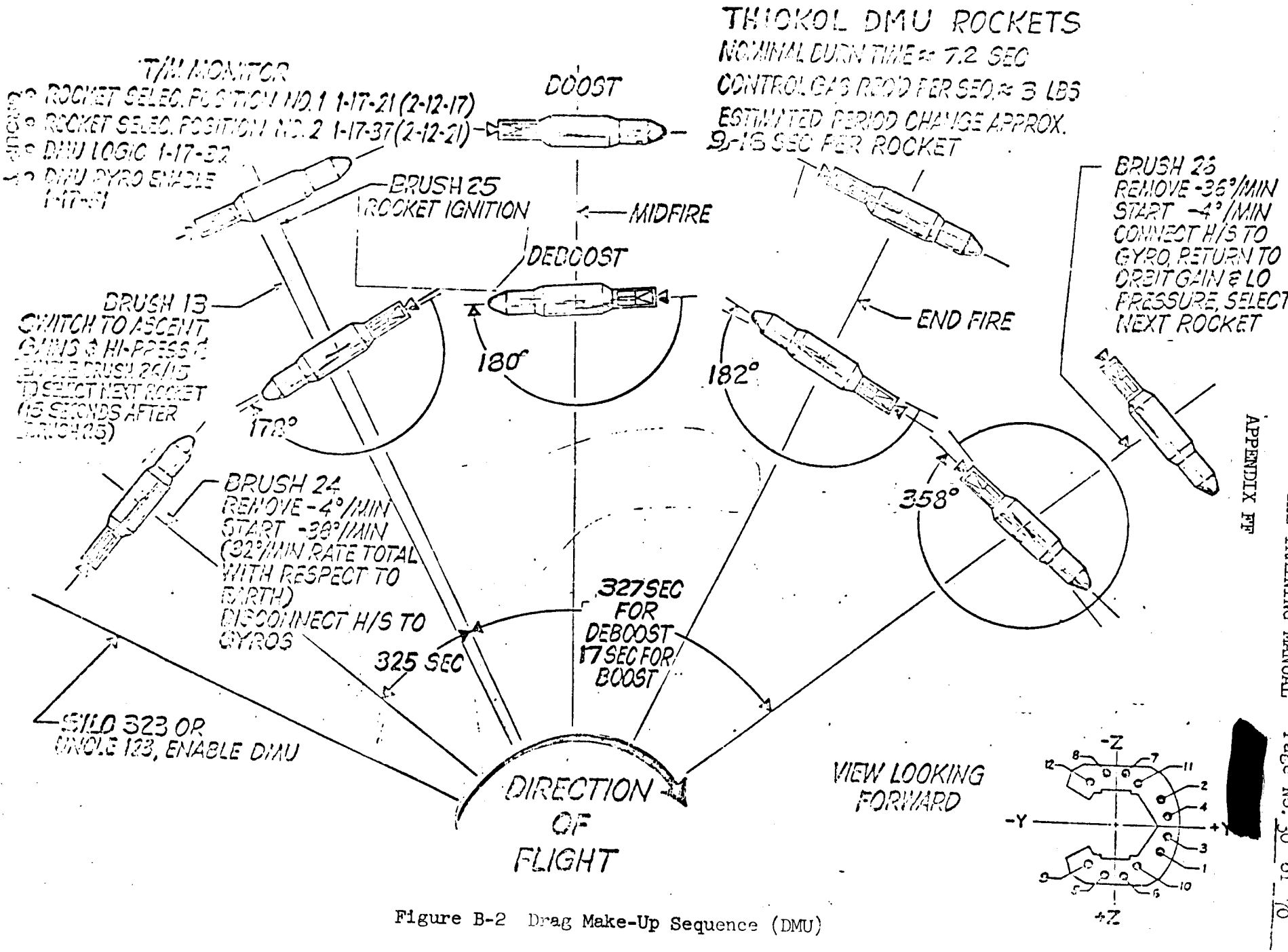

Figure B-2 Drag Make-Up Sequence (DMU)

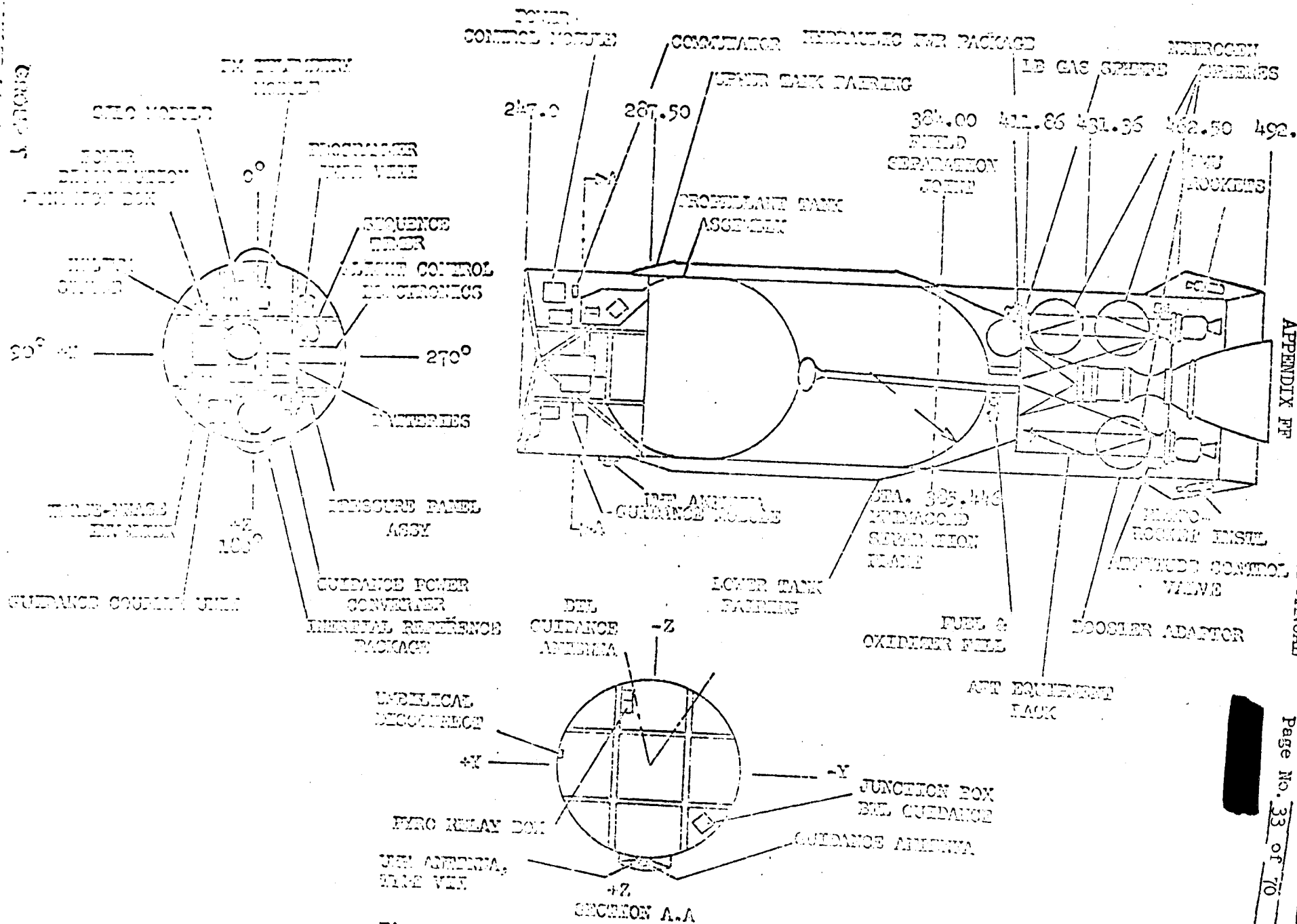

Figure B-6 Agena Imboard Profile

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These paragraphs are added to Section 4.0.

B-4.1.1.3 Drag Makeup (DMU) System. The DMU System provides for adjusting the vehicle orbit by means of firing solid rockets. Mechanical and electrical accommodations for twelve rockets are provided. The number of rockets flown on a particular mission is dependent on the specific mission requirements. Enabling of the rocket firing sequence is by ground command and provides for one rocket firing at a time. Geographical location of the firing, as well as boost/deboost selection, is controlled by the Orbital Programmer programming. The DMU firing sequences are preprogrammed on the orbital tape prior to launch. Provisions are made to lockout DMU firings during recovery maneuvers precluding interference with recovery. A rocket firing, aligned with the vehicle velocity vector, will affect the orbit according to where the rocket is fired. The orbit quadrants are shown in Figure B-36. The qualitative effects of positive velocity increments are shown in Table B-10.

B-4.1.1.3.1 Drag Makeup Rockets. The function of the Drag Makeup Rocket is to increase the orbital vehicle velocity to makeup velocity losses due to aero-drag. It can also be used as part of the ascent phase allowing injection of the Agena at a low altitude, then boosting perigee with the DMU motor thus providing a weight advantage in most cases. The DMU rocket can also be utilized to adjust the orbit in a deboost mode depending on the mission requirements.

The DMU rockets are mounted on the aft bulkhead in a pre-aligned mount. The twelve DMU rockets are fired one at a time as required by orbital conditions.

A choice of two, 13.5 lb. or 10.5 lb., DMU rocket motors are available. They burn an average of 7.2 seconds and deliver a total impulse of 3075 or 2050 lb-sec respectively. The maximum weight of the 12-rocket system is approximately 185 lbs. including the mounting brackets and thermal shields. The maximum total available impulse is 36,900 lb-sec.

The paragraphs B-5.0 through B-5.9 replaces Section B-5.0 in the original text.

B-5.0 GUIDANCE AND CONTROL SYSTEM

The guidance and control system:

a. Provides attitude, time, and velocity references sufficient to control the vehicle along the specified trajectory to attain the prescribed orbit;

b. Provides attitude reference and control of the vehicle in orbit;

c. Provides the proper attitude and commands for the recovery capsule.

A block diagram of the guidance and control system is shown in Figure B-39.

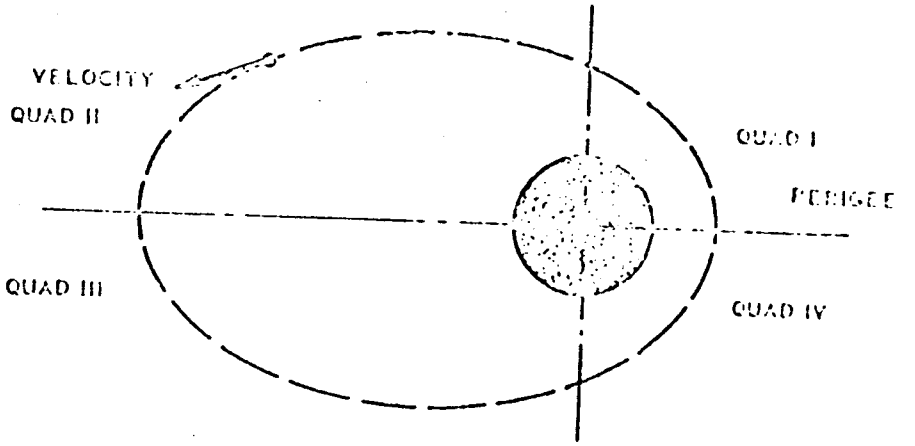


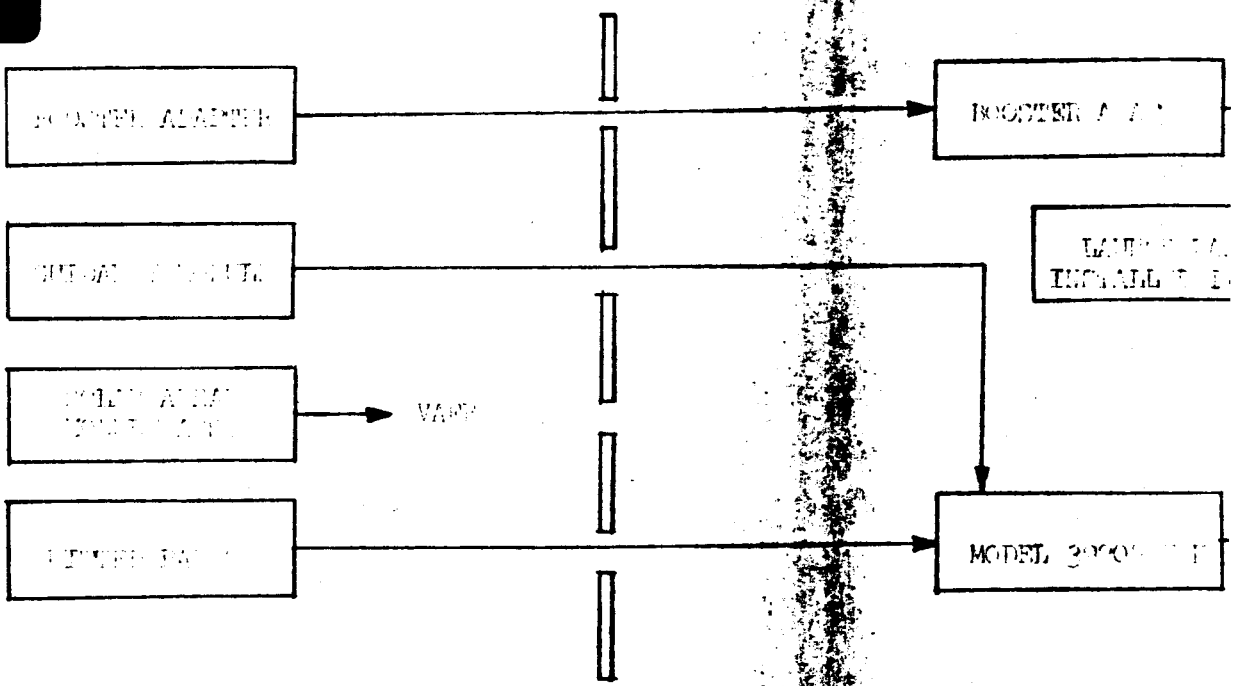
Figure B-36 Drag Make-up System Quadrants

TABLE B-10

DRAG MAKE-UP SYSTEM QUADRANT TABULATION

Rocket Firing Quadrant	Eccentricity	Semimajor Axis	Period	Perigee Location
I	Increases	Increases	Increases	Advances
II	Decreases then Increases	Increases	Increases	Advances
III	Decreases then Increases	Increases	Increases	Recedes
IV	Increases	Increases	Increases	Recedes

PROGRAM MANUFACTURING FINAL



Rocket engine installation
Vehicle alignment
Vehicle wiring harness tests
Battery fit and clearance check
BIL guidance system pressurization
Booster adapter wiring harness
Standard launcher sequence
Pressurization of pneumatic system

FACTORY TO LAUNCH

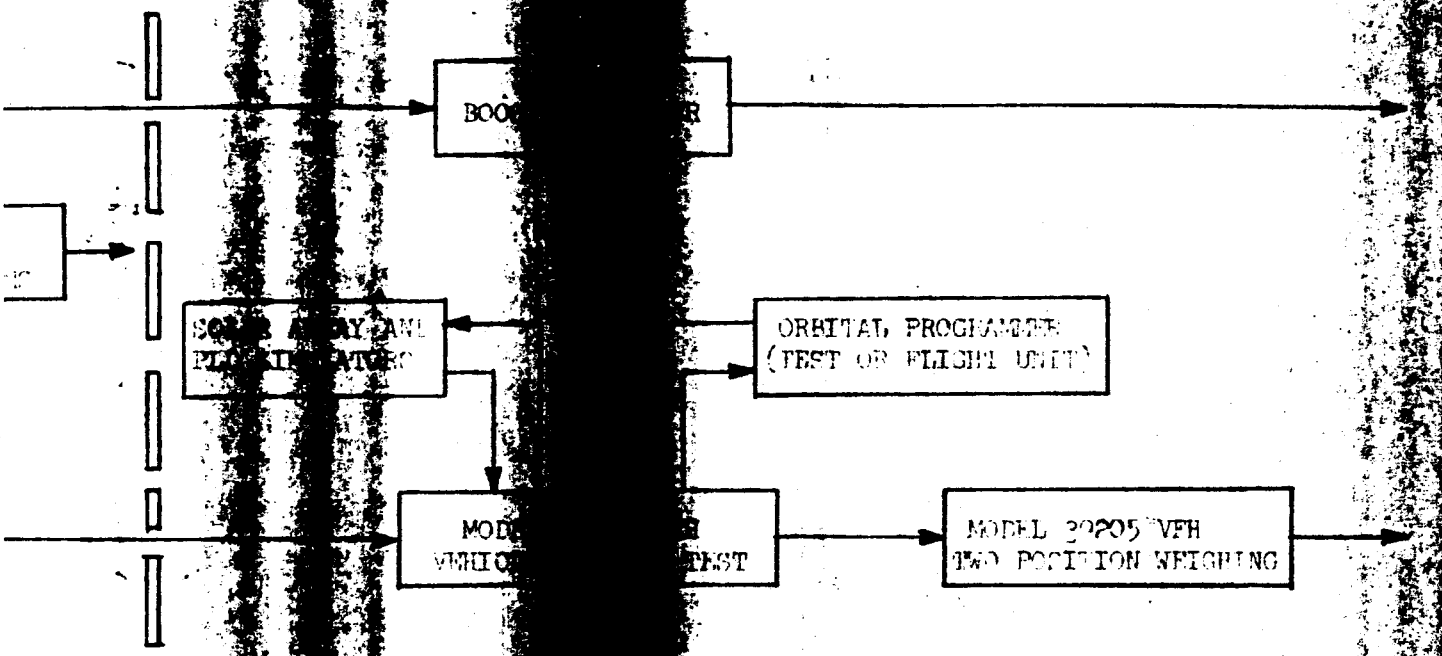
GROUP 4
EXCLUDED FROM AUTOMATIC

SUP[illegible] TO THE TRAINING MANUAL -

[illegible]ENDIX FF

HANDLE[illegible]
CONTROL[illegible]

[illegible]VEHICLE SYST[illegible]CUNTIVALE)



3.03

Vehicl[illegible]hookup and [illegible]continuity check
Vehicl[illegible]power and l[illegible]
Hydrau[illegible]o system ch[illegible]
Guidan[illegible]and flight [illegible]or system tests
BTM t[illegible]s
Commu[illegible]ation and [illegible]system test
S[illegible]r[illegible]y and
B[illegible]o[illegible]erface[illegible] Sec.)
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S[illegible]ul[illegible]ountdow[illegible]
R[illegible]ge[illegible]egratio[illegible]t (backup)
M[illegible]se[illegible]ntegratio[illegible]est (primary)
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R[illegible]um[illegible]ttitude[illegible]tems leak
[illegible]c[illegible]ation
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5.0

Vehicle weighing
Helium leak check
Alignment inspection

Special instructions

For solar array and
Orbital programmer

[illegible]ET B 5

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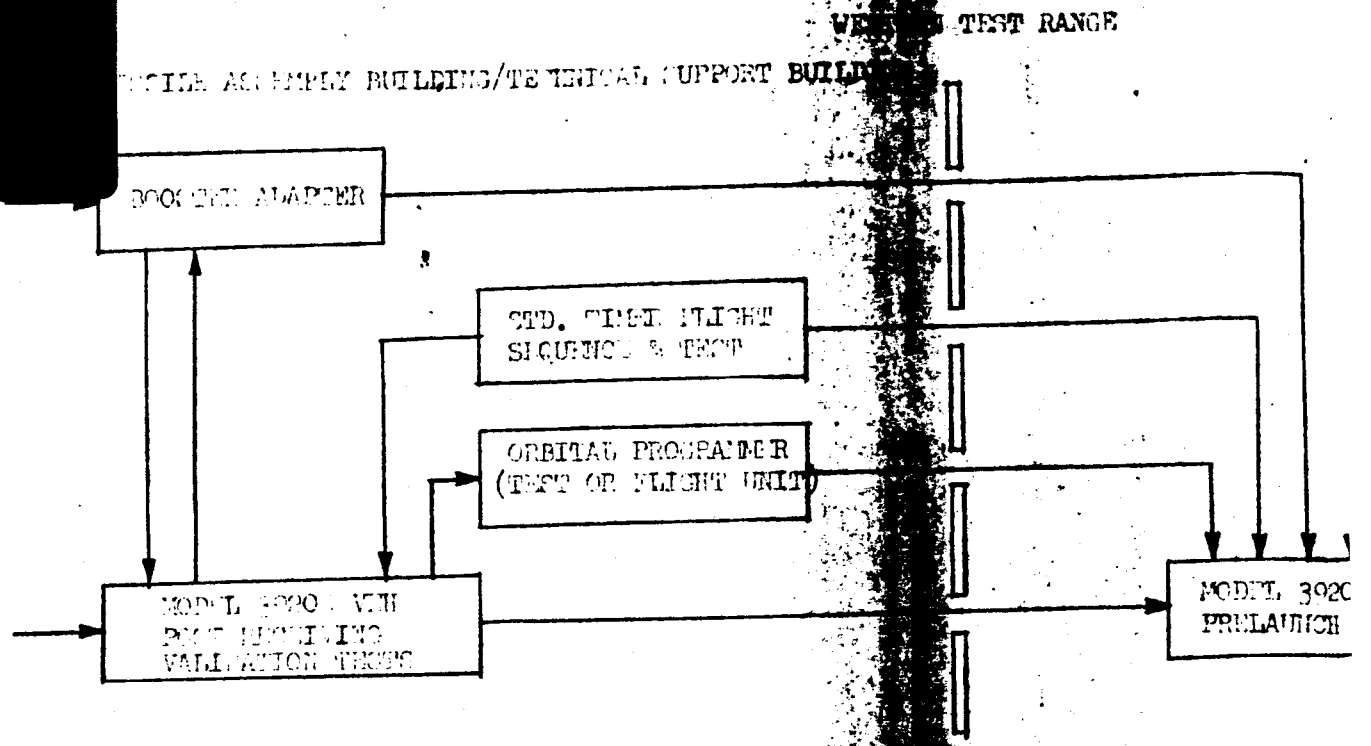
[illegible]et 1 of 2



3.0

Receiving inspection
Booster adapter fit verification
Destruct system test
Alignment requirements
Propulsion system general inspection and servicing
Turbine starter servicing (partial)
Horizon sensor pressure decay test
Standard timer test (as required) sequence chang
Programmer inspection and flight preparation
Performance test (incl. flight tape prep)
Storage recycling req.
Propellant tank bulkhead leak test
UHF guidance and waveguide pressure test
Decoder IX code plug fit check
KIK-decoder test

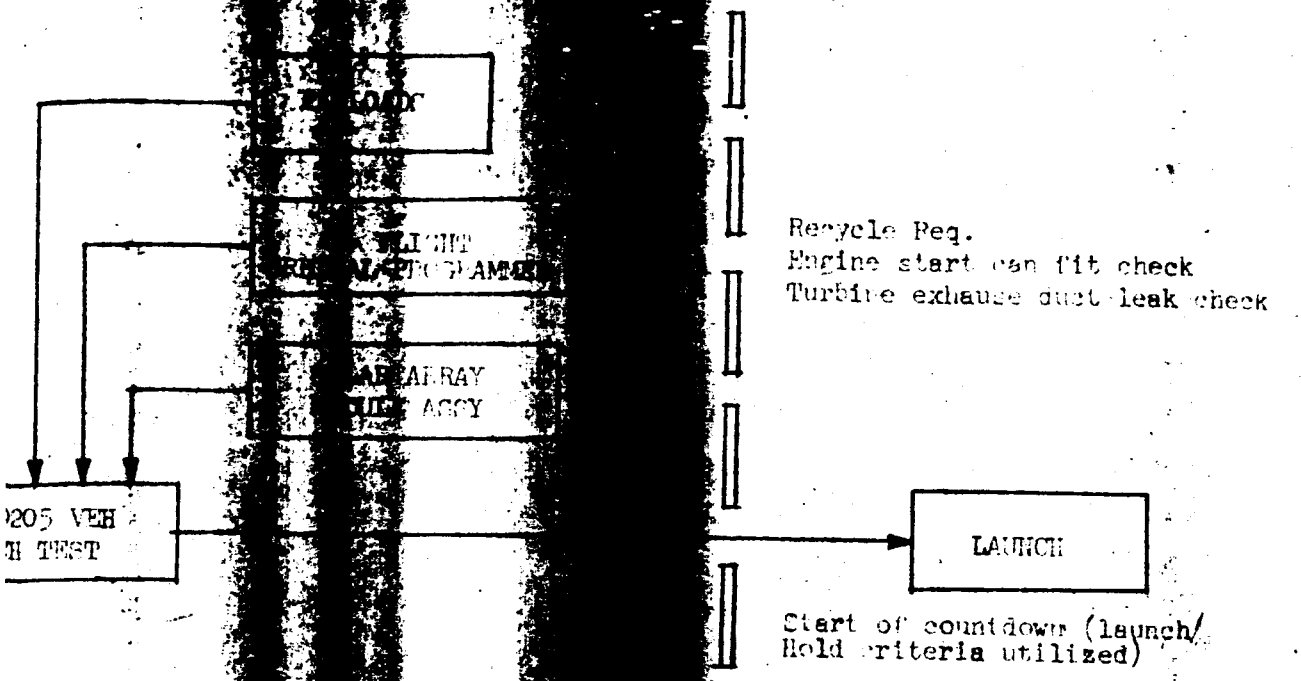
3.05

Primary and L/B a
Pneumatic functio
Engine component
Pyrotechnics inst
Launch vehicle ac
Systems test. Ph
Systems test. Ph
Vehicle hydraulic
Final pressurizat
Destruct initiato
Engine servicing
Turbine starter s
Vehicle final mat
Systems test Phas
Systems test Phas
Fusistor continui
Battery activatio
Solar array modul
General provision
Vehicle recycle r

FIGU

FACTORY TO LAUNCH TE

Sheet



altitude co
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TEST SEQUENCE

Sheet 2 of 2

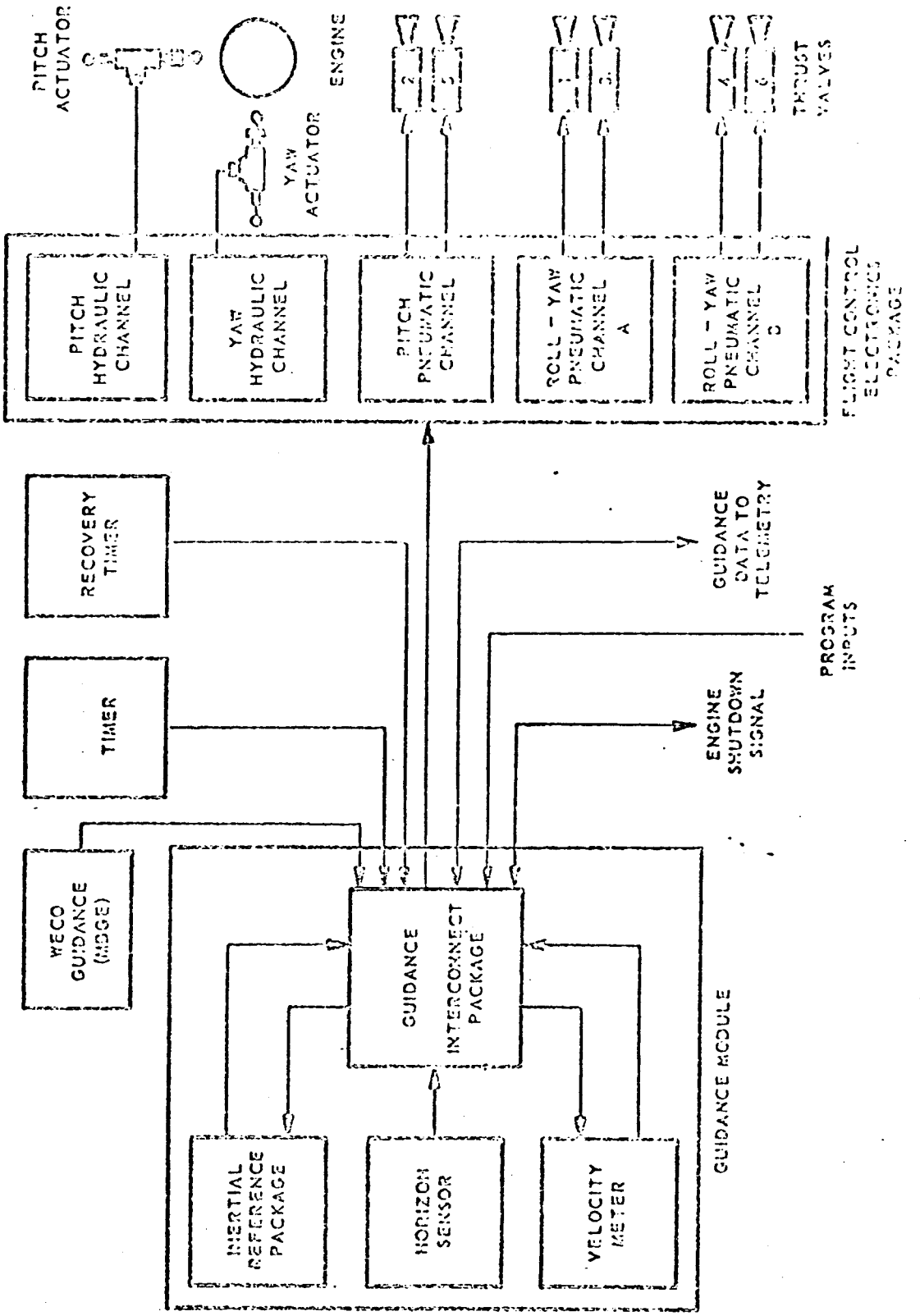

Figure B-39 Guidance and Control System Block Diagram

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B-5.1 Horizon Sensor

The horizon sensor (H/S) provides an earth reference for the vehicle by detecting infrared radiation contrasts between earth and space. (See Figure B-14 in original text). The horizon sensor generates a corresponding output which is transformed into pitch and roll error signals. These signals are fed to the inertial reference package (IRP) in the form of torquing signals to the pitch, yaw and roll gyros for vehicle attitude control.

B-5.2 Inertial Reference Package

The inertial package contains three single-degree-of-freedom rate-integrating gyros, each individually oriented so that it senses the angular displacement of the vehicle about one of the three major vehicle axes. The primary function of the three gyros is to maintain the vehicle in a fixed attitude with respect to inertial space. The gyros detect the difference between the attitude of the vehicle and the IRP reference attitude and generate an error signal with an amplitude proportional to the difference in attitude. The signal is processed through the flight control (F/C) electronics to the pneumatic and/or hydraulic components of the system.

B-5.3 Velocity Meter

The velocity meter senses vehicle change in velocity over a specified period of the engine burn time and sends a signal for engine shutdown after the desired velocity has been achieved. The velocity meter consists of an accelerometer, and a counter. Acceleration of the vehicle is sensed by the accelerometer and is processed by the electronics. A pulse counter is used to count down the output of the accelerometer and provide a switch closure when the required velocity has been achieved.

B-5.4 Guidance Interconnect Package

The guidance interconnect package provides the electrical means of interconnecting the guidance and F/C components, gain change logic, telemetry conditioning circuitry, and fixed torquing program circuits.

B-5.5 Standard Timer

The standard timer dictates the sequence of guidance and control system ascent functions, as well as switching for other vehicle functions. The standard timer is an electro-mechanical device consisting of 72 cam-actuated switches and a three-phase motor. The timer setting resolution is 1.0 second with a repeatability of 0.2 second. It is capable of a 6000 second maximum operation and provides 24 discrete events.

B-5.6 Recovery Timer

The recovery timer is a solid state device utilizing core logic and latching relays. Its function is to provide the required recovery sequence. The recovery timer has the capability for thirteen switching events and is capable of being programmed for a maximum timing range of 0 to 98,304 seconds. The timer accuracy is 0.5 second or 0.1 percent of the time between events, whichever is greater.

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APPENDIX FF

B-5.7 Flight Control System

The principal function of the flight control system is to provide control of the vehicle attitude in response to signals from the guidance system. Both the hydraulics and pneumatics are controlled by the IU through the F/C electronics. During the engine sequence of operation, control of the thrust vector (pitch and yaw) is attained by the use of hydraulic actuators while roll attitude is controlled by pneumatic gas jets. During all other phases of operation, the pneumatic control system maintains vehicle attitude through the use of six thrust controllers for pitch, yaw, and roll control.

B-5 7.1 Pneumatic Control System (Primary)

The pneumatic control system exerts control forces on the vehicle by release of cold gas through thrust valves to produce three-axis corrective torques. The system consists of six thrust valves in two clusters, a pneumatic regulator, and three 2200 cu. in. control gas storage spheres. The location of the pneumatic system hardware and the thrust valves required for correcting various attitude errors are depicted in Figure B-15 in the original text. The thrust valve cluster nozzles provide a thrust of ten pounds when in the high-pressure mode (100 psia), and a thrust of one-half pound when in the low-pressure mode (5 psia). The high-pressure mode is normally used during ascent, DMU rocket firing maneuvers, and recovery portions of the flight, while the low-pressure mode is used during the orbit phase of the mission. The pneumatic control gas consists of a mixture of Nitrogen and Freon. The percentage of mixture is flight-peculiar and dependent upon mission requirements. Different densities, loaded weight, specific impulse, and total available impulse. Figure B-17 is a block diagram of the basic pneumatic control system.

B-5.7.2 Hydraulic Control System

The hydraulic control system provides control of the vehicle during periods of engine operation. Directional control in pitch and yaw is accomplished by gimballing the rocket engine thrust chamber by means of hydraulic actuators controlled from the flight control electronic unit. Hydraulic power for the actuators is supplied from a hydraulic power package driven by high-pressure unsymmetrical dimethylhydrazine. (See Figure B-18 in the original text.)

B-5.8 Lifeboat System

The Lifeboat (L/B) system is an auxiliary system for backing up the primary recovery system. It is capable of orienting an unstable vehicle, having rates of up to 20 degrees per second along any axis, within 1.5 minutes, and holding the orientation for more than 30 seconds. The Lifeboat system is capable of overcoming a guidance and control failure and/or a primary command system failure. Two basic modes of operation for the Lifeboat system consist of a complete Lifeboat mode using the Lifeboat control and pneumatic system, and a mode using only the Lifeboat timer and UNCLE command system. The vehicle conditioning of the various Lifeboat modes is accomplished through the UNCLE command link Type 22 decoder. Each of the modes has an UNCLE Type 22 command assigned for it. The function of the command is to condition relays in the Lifeboat junction box to enable the required mode

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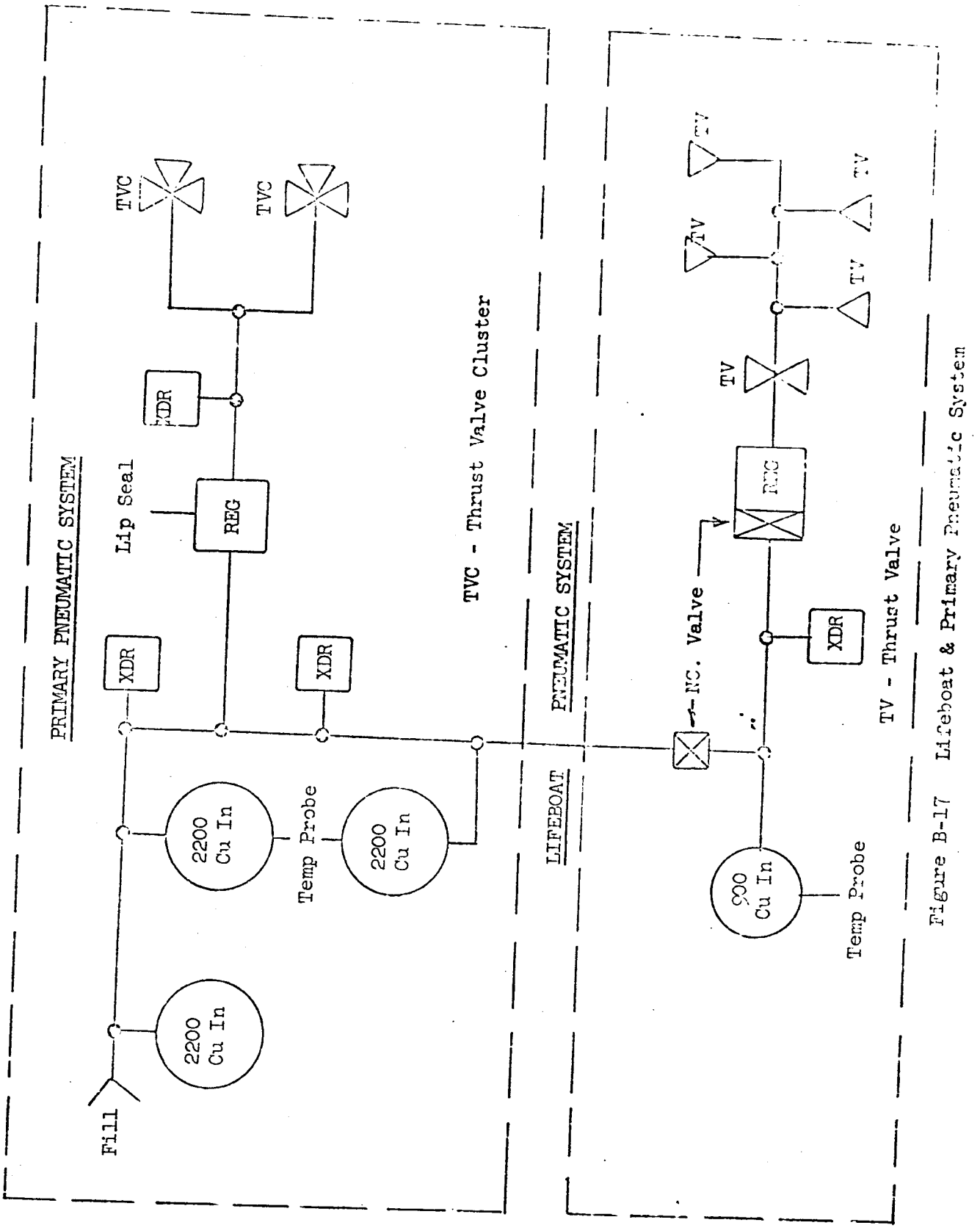

Figure B-17 Lifeboat & Primary Pneumatic System

B-5.8 (continued)

functions. The L/B timer start command is a KIK UNCLE (secure command) specifically assigned for this purpose. Two such commands are available, enabling the start of the Lifeboat timer twice per flight. For safety purposes, the command used to start the Lifeboat timer is thereafter permanently locked out by relay logic in the Lifeboat junction box. In addition, the timer start event locks out the unsecure mode commands so that no inadvertent mode change command can enter while the sequence is in progress. The contributing attitude error sources (RSS) from the Lifeboat system are plus or minus 7.50 deg. about the reentry plane.

The L/B system utilizes:

a. An independent auxiliary RF command link between the ground station and the orbiting vehicle, and
b. An independent terminal attitude control system.

Availability of these back-up functions provides redundancy of all significant aspects of recovery, except batteries.

B-5.8.1 Major Components

The major components of the Lifeboat system and their relationship to each other are shown in Figure B-33 and described in the subsequent paragraphs.

B-5.8.2 UNCLE Communications Equipment

The UNCLE equipment provides the communications link from the ground to the vehicle for the Lifeboat system.

B-5.8.3 Control System Equipment

The function of the attitude control system is to align the vehicle with the earth's magnetic field vector. The attitude control equipment is specified in two general categories, namely, electronics and pneumatics. (See Figures B-16 and B-35 in the original text.)

B-5.8.3.1 Electronics

a. Magnetometer. The magnetometer is the attitude sensing device for the Lifeboat system. It is comprised of an electronics unit and a sensor unit. In the sensor unit there are three orthogonally arranged probes containing a highly permeable magnetic core surrounded by an excitation and a signal pickup winding. These probes sense the magnetic field intensity along their sensitive axis and supply a signal, proportional to the intensity, to the electronics unit. The output signal is proportional to attitude offset about the lifeboat axes.

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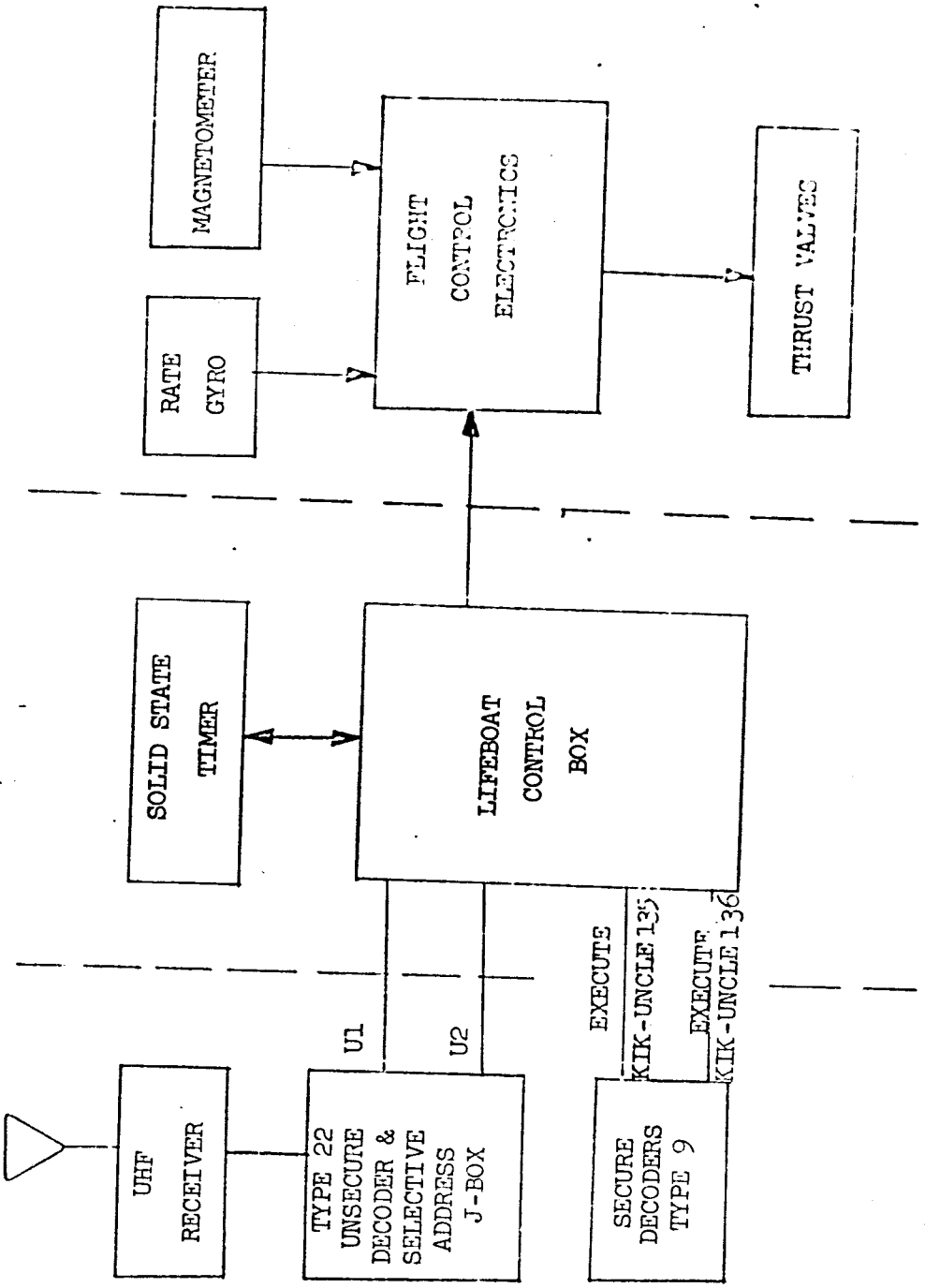

Figure B-33 Lifeboat System

b. Roll Rate Gyro. The function of the roll rate gyro is to control the rate of change of vehicle motion about the roll axis. It is designed to limit the motion to plus or minus two degrees per second for proper operation of the lifeboat system. The roll gyro senses the vehicle roll rate and supplies a signal proportional to the rate into the F/C electronics roll channel.

c. Flight Control Electronics. The flight control electronics contain three electronic channels and telemetry monitoring circuitry. Its function is to accept signals from the magnetometers and rate gyro and to convert them into appropriate commands to the pneumatic system for control of the Agena.

d. Lifeboat Timer. The lifeboat timer is a solid state device utilizing core logic and latching relays. Its function is initiate the required lifeboat sequence. The timer provides the capability of thirteen switching events and is capable of being programmed for a maximum timing range of 0 to 98,304 seconds. The timer accuracy is 0.5 second or 0.1 percent of the time between events, whichever is greater.

e. Lifeboat Junction Box. The lifeboat junction box provides the electrical means of interconnecting the lifeboat components. It also incorporates telemetry monitoring circuitry for the system functions, and landline control monitor points.

B-5.8.3.2 Pneumatics

The pneumatics portion of the lifeboat system provides the means for changing the vehicle attitude through the use of six thrust controllers, supplied by a storage sphere through a pneumatic regulator. The valves shall operate with an ON/OFF type operation at a 10 point nominal thrust level. The regulated pressure shall range from 110 to 130 psig. Utilization of a regulator/solenoid valve assembly in the lifeboat system allows turn ON/OFF control of the gas supply to the valves.

The control gas mixture in the L/B system is the same as that in the primary pneumatic system. The two systems are filled through one line and isolated by means of a solenoid operated valve. This valve is capable of being opened by RF command; thus utilizing all available control gas by either of the two systems during flight.

B-5.9 BTL Adapter Kit

The BTL adapter kit is required to accommodate installation of the Bell Laboratory (BTL) command guidance system in the Agena. The Kit consists essentially of the BTL skin, UHF traveling wave slot antennas (ventral and dorsal), wire harnesses, BTL umbilical door, BTL control package, ventral and dorsal fairings, fairing covers, and necessary mounting equipment, are Government-Furnished Equipment (GFE) and not part of this kit.

During early stages of ascent, BTL commands are transmitted to the vehicle via the dorsal antenna. After pitchover, the commands are transmitted to the vehicle via the ventral antenna. In order to optimize the ascent trajectory for a low-angle pitchover, it is necessary to [illegible] reception of the BTL commands. To minimize interference pattern [illegible] the two BTL antennas during the later stages of ascent, a controllable attenuator is installed in the wave guide of the BTL dorsal antenna. The attenuation is controlled by a BTL discrete command.

The Agena-installed BTL radio command system is used to provide the Agena with increased accuracy during ascent and injection into orbit. By controlling the vehicle into the desired orbit, this eliminates any requirement for a second burn to correct an orbit anomaly. The BTL system also provides discrete commands in addition to the steering commands in conjunction with the standard timer of the Agena.

B-5.9.1 BTL Steering Commands

At booster engine ignition and as the vehicle lifts off the launch pad, Western Electric Company (BTL ground station) transmits RF (radio frequency) steering commands to assure proper attitude during ascent and injection into orbit. These commands are divided into two categories: commands to the Thorad booster and commands to the Agena satellite upon separation from the booster. This program uses the commands to "guide" the vehicle into the desired orbit, rather than engine restart and a second burn. The BTL steering commands actuate relays within the BTL canister to provide 400 Hz alternating current to the torquing amplifier and demodulator associated with the pitch and yaw IRP channels. The phasing of the 400 Hz signal determines the pitch up, pitch down, yaw left, and yaw right responses. The rate of response is 2 degrees per second, which provides fine adjustments to the preprogrammed rates and times supplied by the standard timer.

B-6.0 ELECTRICAL SUBSYSTEM

B-6.1 General

The electrical subsystem comprises two major categories of equipment; one providing unregulated and pyro power and its distribution, and the other providing destruct capability.

B-6.2 Electrical Power System

The electrical power system furnishes power at the voltage levels and frequencies required by the associated vehicle subsystems and payload equipment for a time period consistent with the vehicle mission duration. The Agena power system is made up of power source components, power conversion components, and power control and distribution components. The power source components consist of a solar array and two primary batteries to supply the initial source of energy to the power equipment and other system components, as well as secondary batteries to supply power to the destruct system. The power conversion components consist of the Type XIIA, 400-Hz, 115 vAC, three-phase inverter and two Type IXA DC-DC converters. Vehicle power

is controlled by the main power transfer switch, which is capable of transferring from aerospace ground equipment external power during test to internal vehicle power. Power control and distribution [illegible] of the power transfer switch current, voltage, power and temperature monitors, and wiring harnesses for distribution of electrical energy to the system components. The power distribution system is shown in Figure B-19.

B-6.2.1 Power Source Equipment

The main battery/solar array system of the Agena provides the power source for unregulated voltage and pyro power ranging between 22.5 to 29.25 vDC. The amount of available electrical power depends upon the use of a ten panel solar array and the type and number of batteries required for the mission to be flown. Two batteries are normally installed in the forward equipment secion. A three battery kit is available if additional power is required. Space for two batteries is also provided in the aft rack support structure.

B-6.2.1.1 Solar Array

The solar array is made up of 10 panels, each containing 960 solar cells, each 2 x 2 CM. The array has an active surface area of about 41.3 sq. ft. and is capable of generating 400 watts of power.

Figure B-37 shows the solar array in its normal (deployed) operational position on the space craft. Two pin pullers located on the +Z and -Z sides hold the array in its stowed condition with deployment after injection into orbit being initiated by stored command. Deployment takes place by means of a scissoring action imparted to the panels by a compression spring/damper mechanism. The array is adjustable by $\pm 30^{\circ}$ (above and below horizontal) from its nominal deployment position by changing the length of the first section of the scissor mechanism. This adjustment feature is called the "alpha (α) adjust" and is provided to secure optimum power as the satellite deviates away from nominal solar flux because of normal orbit plane rotation or regression.

The output power of the solar array is a direct function of solar flux density. The vehicle is normally launched from VAFB in a north-south near polar orbit. For any launch with an inclination angle other than 97°, there will be progression or regression of the orbital plane of the space craft from the earth/sun line with a resulting change in solar flux density. The angle between the earth-sun line and the orbital plane is called the Beta angle and is a function of both launch time and date. Figure B-38 shows a plot of beta change for a 21 day mission as a function of inclination angle. This plot is absolutely correct only during a single point in time and is shown only as a guide. The effect that the alpha (α) adjust angle has on the power generation capability of the solar array is shown as a function of beta angle.

For clarification, let us take a simple mission as an example. A vehicle is launched into orbit at an inclination angle of 85° producing a beta change of 37.8° in 21 days after launch. Assume for this example that the regression is linear and that the rate is 1.8°/day. The vehicle is launched at about 1400 hours (a beta of 30°) with the array set to an alpha angle (α) of 0°. At the time of launch, the array is capable of producing 27.7% of its peak power. Since the maximum power capability of the solar array is 400 watts, the array will be producing 111.0 watts at

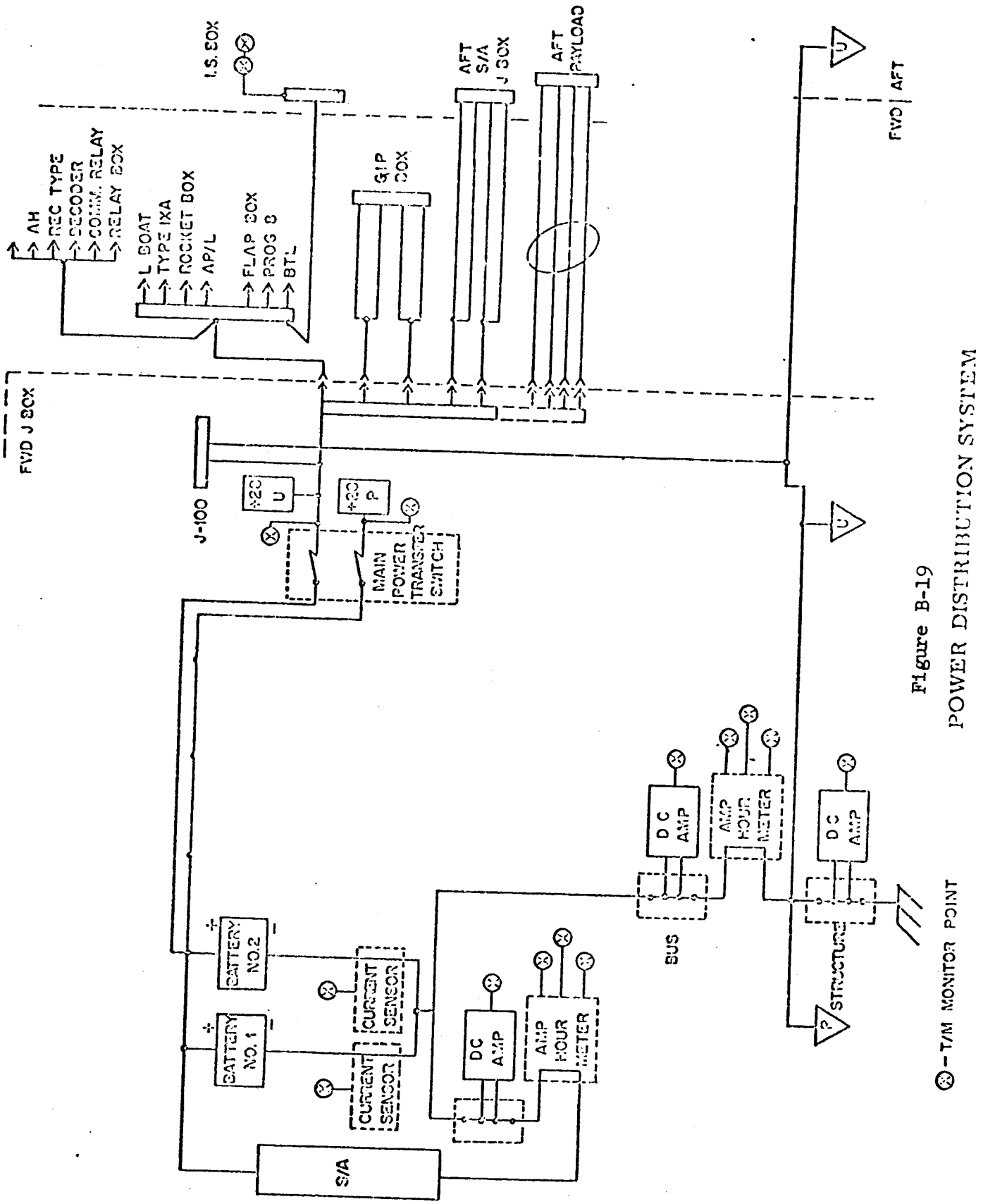

Figure B-19
POWER DISTRIBUTION SYSTEM

⊗ – T/M MONITOR POINT

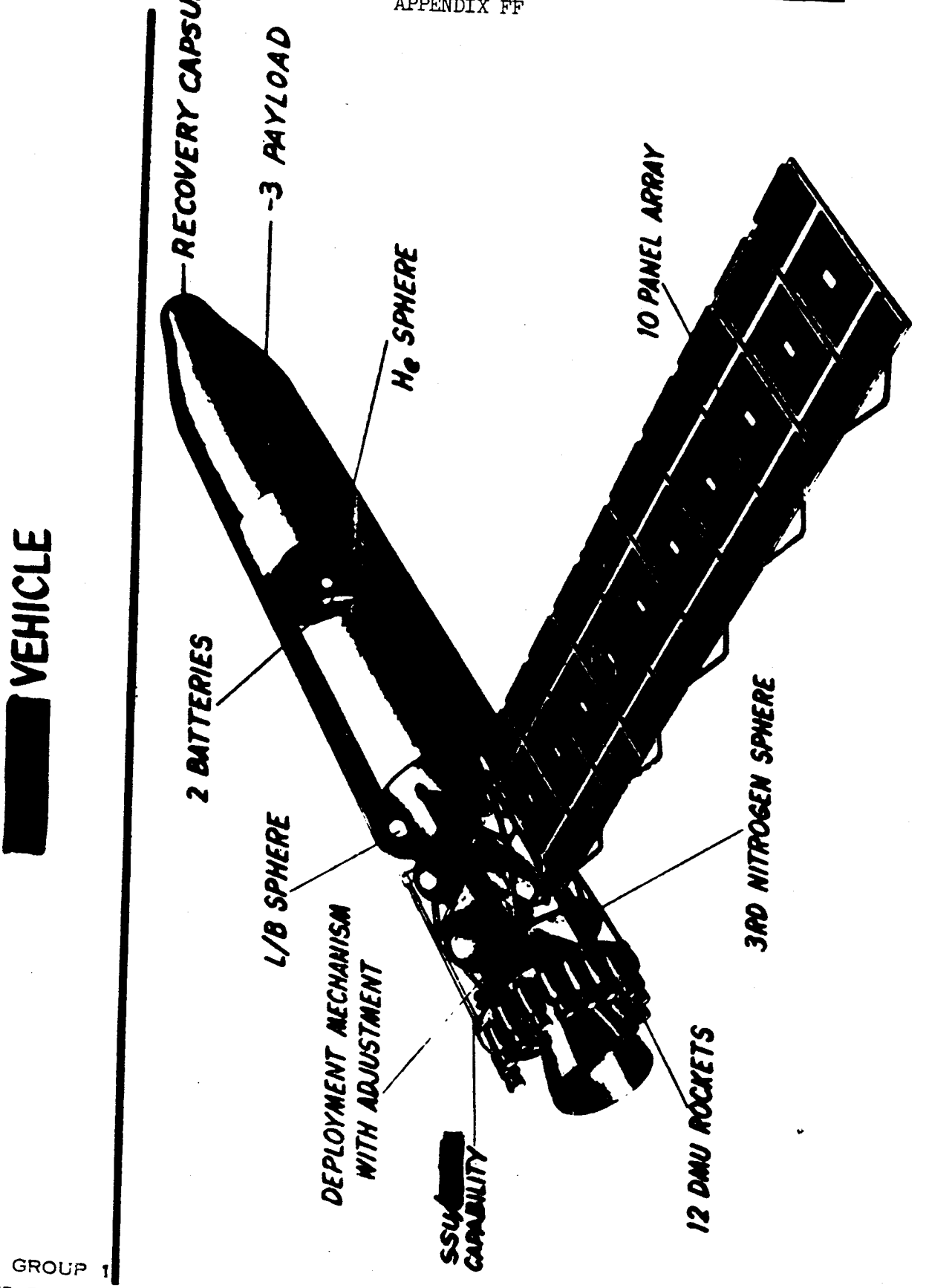

FIGURE B37 SATELLITE VEHICLE CONFIGURATION

GROUP 1
EXCLUDED FROM AUTOMATIC DOWNGRADING AND DECLASSIFICATION

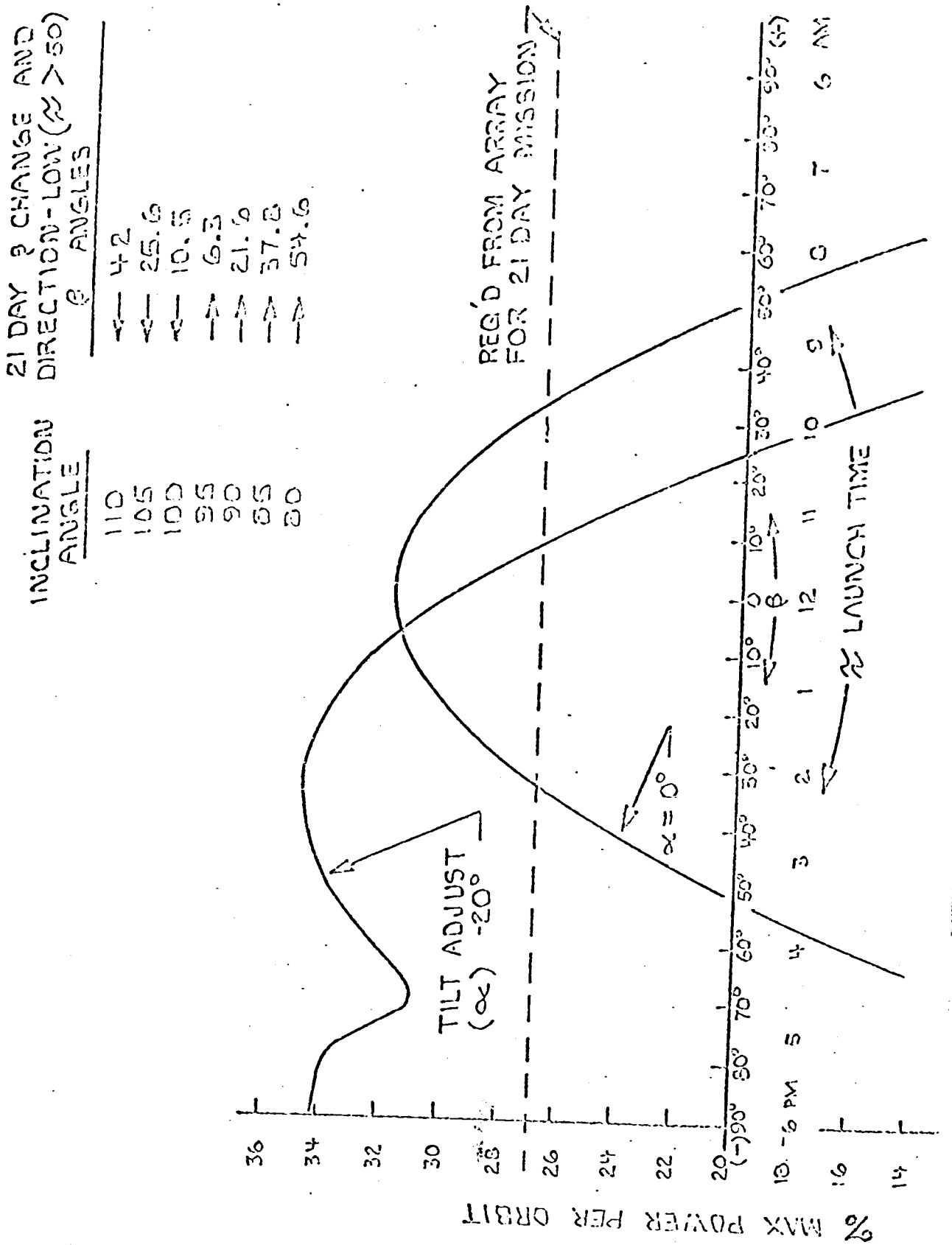

Figure B-38 Power Output as Affected by Solar Flux Density

the start of the mission. Five days later, the power has increased to 119.6 (29.9%), 10 days later it is 125.6 watts (31.4%), 15 days later it is 127.3 (31.9%), and at the end of the mission, the array is producing 126.5 watts (31.6%). A typical solar array performance as shown in Figure B-21.

B-6.2.1.2 Batteries

Primary batteries, including the 3 battery kit are all Type 1H. The destruct batteries are Type VIA. Battery parameters are shown in Table B-5A. Battery loading of the Agena is dependent on performance capability, and mission power requirements. The maximum battery capacity is seven type 1H batteries. Table B-1 notes a typical battery installation. The power capacity of the batteries varies with temperature. Minimum battery power capability at the predicted flight temperatures provided must exceed the nominal requirements by twenty-five percent. The mission power requirement is dependent on mission selection, such as number of active days, altitude and orbit plane inclination. The nominal power usage and expected tolerances of the vehicle and payloads are shown in Table B-2. The altitude and inclination affect the number of tracking stations acquired and the length of acquisition; therefore, varying the power requirement. The primary batteries are zinc-silver oxide type and use potassium hydroxide as the electrolyte. They have high-energy ratings and are rechargeable.

The secondary battery system provides power for the destruct system. Two type VIA secondary batteries provide the necessary power for the basic self-destruct system. They are installed in the booster adapter assembly and remain with it when the booster adapter separates from the Agena. The secondary batteries contain positive electrodes of nickel hydroxide, negative electrodes of cadmium hydroxide, and use potassium hydroxide as the electrolyte.

SOLAR ARRAY SYSTEM PERFORMANCE

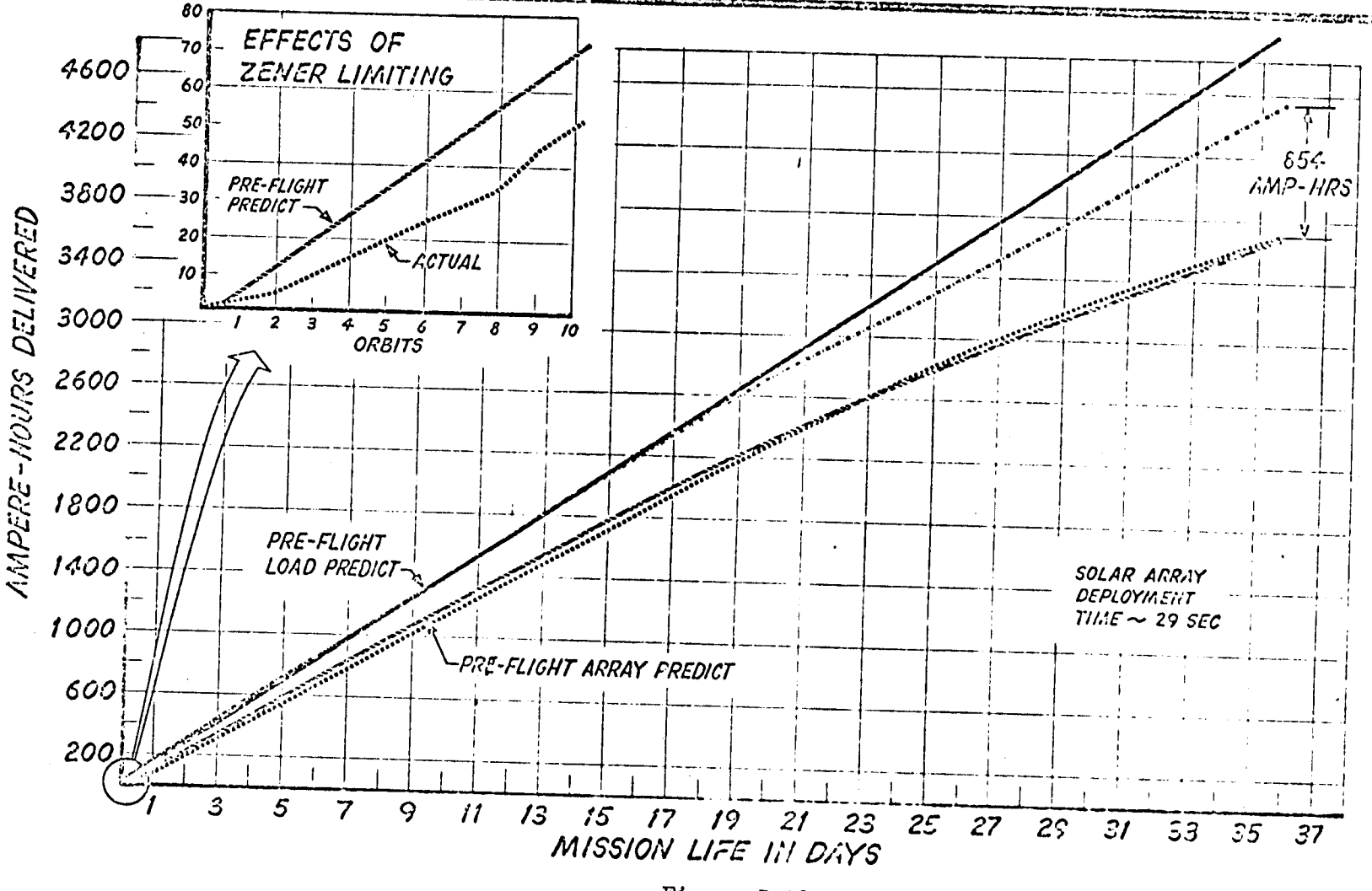

Figure 5-21

SUPPLEMENT TO THE TRAINING MANUAL [redacted]

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TABLE B-5A

BATTERY PARAMETERS

Battery	Cells	Weight	Nominal No Load Voltage (1.8V/ Cell)	Capacity Watt/Hrs. @ 24.3V	@ 70 F. Amp/Hrs. @ 24.3V	Nominal Effeciency (Watt Hrs. In)
Type 1-H	16	124 lbs.	28.8	12,925	531.6	105.0
Type VIA	6	1+ lbs.	8.4	1.32	0.18	-

TABLE B-2

NOMINAL POWER USAGE AND TOLERANCE

Area	Nominal Power Req/Day (Including Losses) (Watt Hours)	Expected Tolerance (Watt Hours)
Propulsion and WECO Guidance	50 (ascent only)	± 10
Electrical System	890	± 85
Guidance and Control	1440	± 120
J-3 Payload	760	± 55
Secondary Payloads (Link II, T/R, [redacted]	170	± 10
Communications and Control	590	± 50

SUPPLEMENT TO THE TRAINING MANUAL

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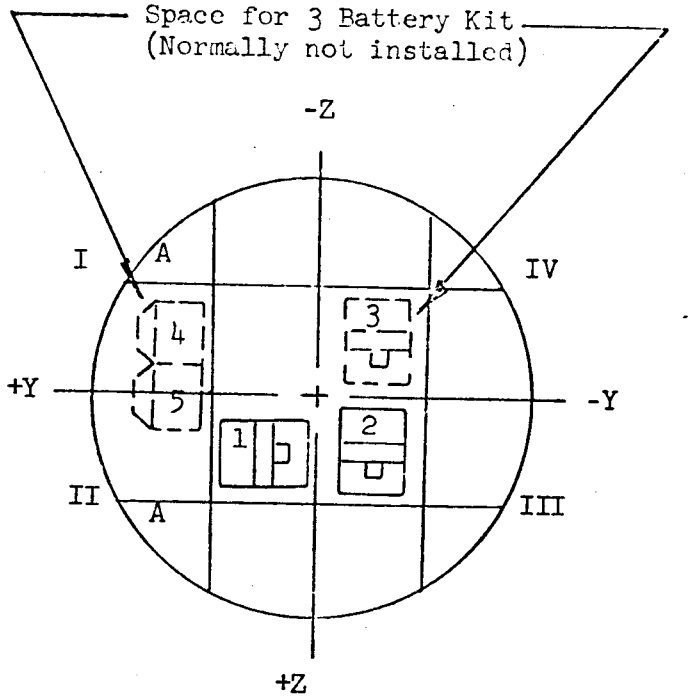
Table B-1 Typical Two Battery Configuration



1H Battery Parameters

Cells	16
Weight	124 lbs.
No load voltage	28.8V
Capacity	12.925 Watt Hr. 531.6 Amp Hr.

Battery Location	Batt. Type	Flight Temp Meas. No.	Batt. Ref. No.	Plug No.	Current Sensor Meas. No.
*Quad. I Upper	1H	C 14	4	3C8P1X	C293
*Quad. II Side Bay	1H	C 15	5	4C8P1X	C294
Quad. II	1H	C 10	1	1C7P1X	C289
Quad. III	1H	C 11	2	2C7P1X	C290
*Quad. IV	1H	C 13	3	2C8P1X	C292

* For Kit Use Only

B-7.2.1 Real Time Command System

The Command System consists of two command links, the SCLE and digital. The Space Ground Line Equipment (SCLE) command link carries 39 unsecure SILO commands and four secure KIK-SILO commands. Of the 39 SILO commands, nine are assigned to vehicle functions (orbital programmer controls, re-entry select, etc.) and 19 are assigned to primary payload functions. The remaining commands are either spares or are used for secondary payloads. Two of the four KIK-SILO commands are assigned recovery enable function. The other two are assigned to primary payload functions.

The digital command link (UNCLE) carries 39 unsecure commands and 3 secure KIK-UNCLE commands. Of the 39 UNCLE commands, 28 backup the SILO commands and two provide Lifeboat commands. A system of command interlocks is provided to minimize the effects of inadvertent or covert commands. A block diagram of the command systems is shown in Figure B-23.

B-7.2.1.1 SILO Command Link

The SILO command link is a digital command system adapted to the Space Ground Link System verlort or prelort radar which transmits the command data on a modulated RF carrier. The configuration is shown in Figure B-23 and consists primarily of a Receiver Demodulator Type 3, Digital Decoder Type 22, and a Command J-Box. The Receiver-Demodulator receives and detects command data from a frequency shift keyed/phase modulated RF carrier (See Figure B-26A) and converts it into digital command output signals. The output signals consist of pulses on the S, 0, 1 or read lines which are conducted to the decoder Type 22. (See Figure B-26B). The RF carrier input (1790 GHz) is modulated by 1.5 MHz. The digital command decoder receives the (positive true logic) S, 1, or 0 digital and the clock signal from the receiver/tone demodulator. The serial train of digits contained in the command-word consists of a 16-bit word. Not all of these 16 bits are part of the command word. In addition to the command bits, there are bits for address parity and reset. After successfully decoding and authenticating the transmitted signal, a pulse output (28.0V) of 350 $\pm$ 125 millisec duration will appear on the appropriate output line for operation of relays in the command relay J-box. At the execution of a good command, or detection of a defunct command, the digital decoder resets itself and assumes readiness to receive a new command.

The digital command decoder is capable of handling 39 coded commands and provides outputs to telemetry for monitoring status, power levels, and telltale information on: (1) Commands, (2) Signal Reception, (3) Temperatures, (4) Execute Verifications, and (5) Power Supply.

The command relay J-box is used to isolate the commands from the SILO command system to the vehicle function. SILO 302 (Write Command) is only command not buffered by this relay J-Box.

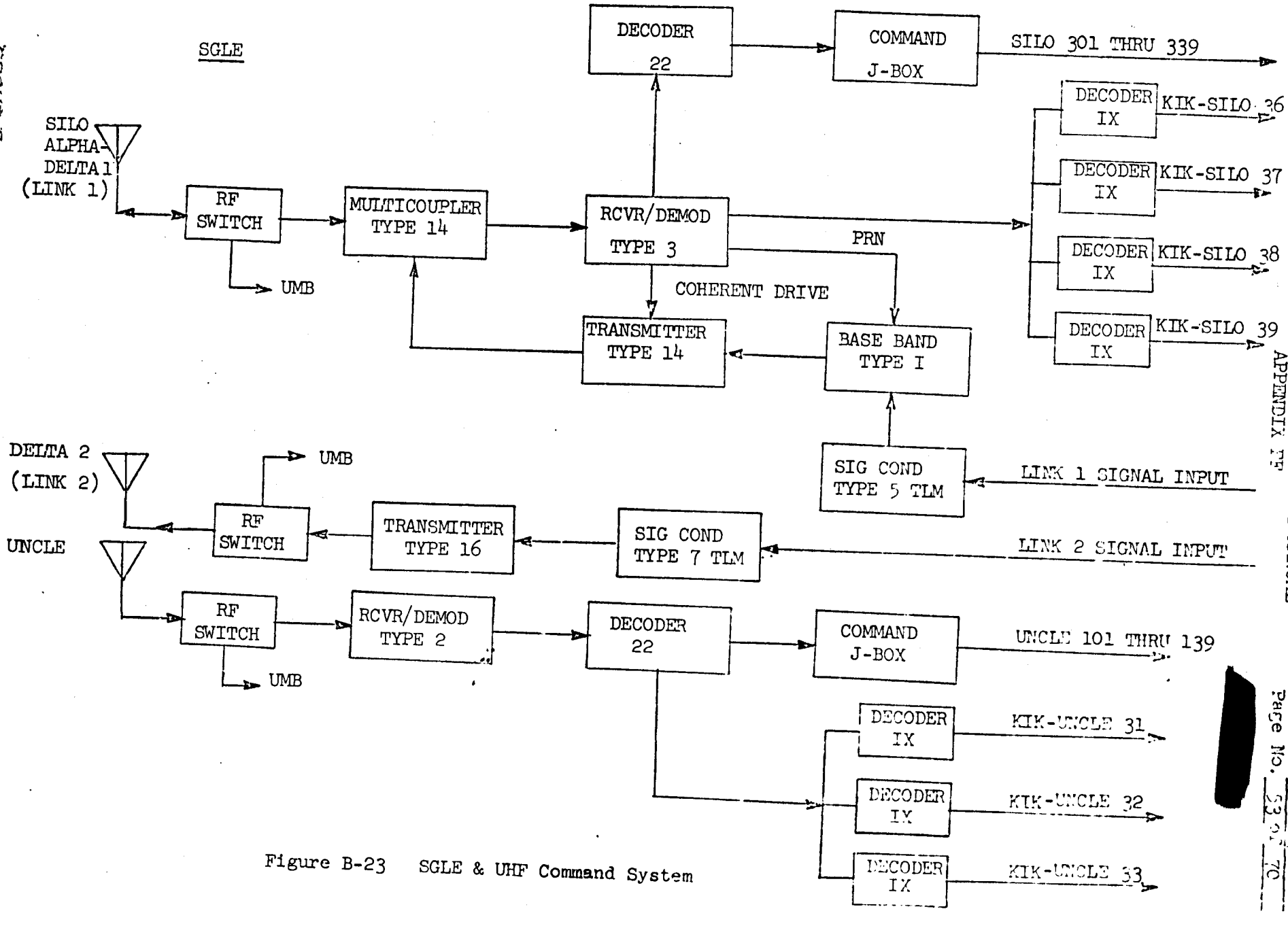
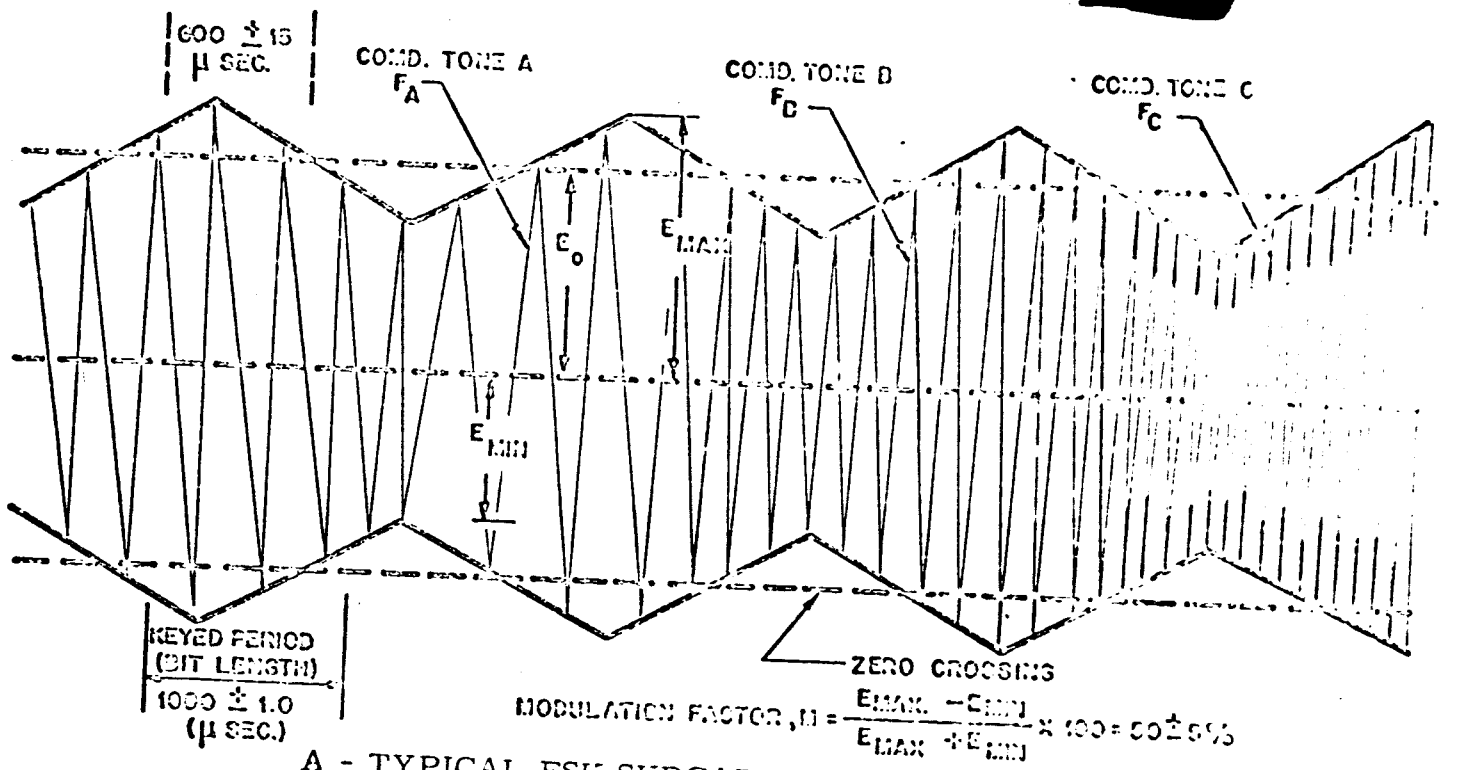
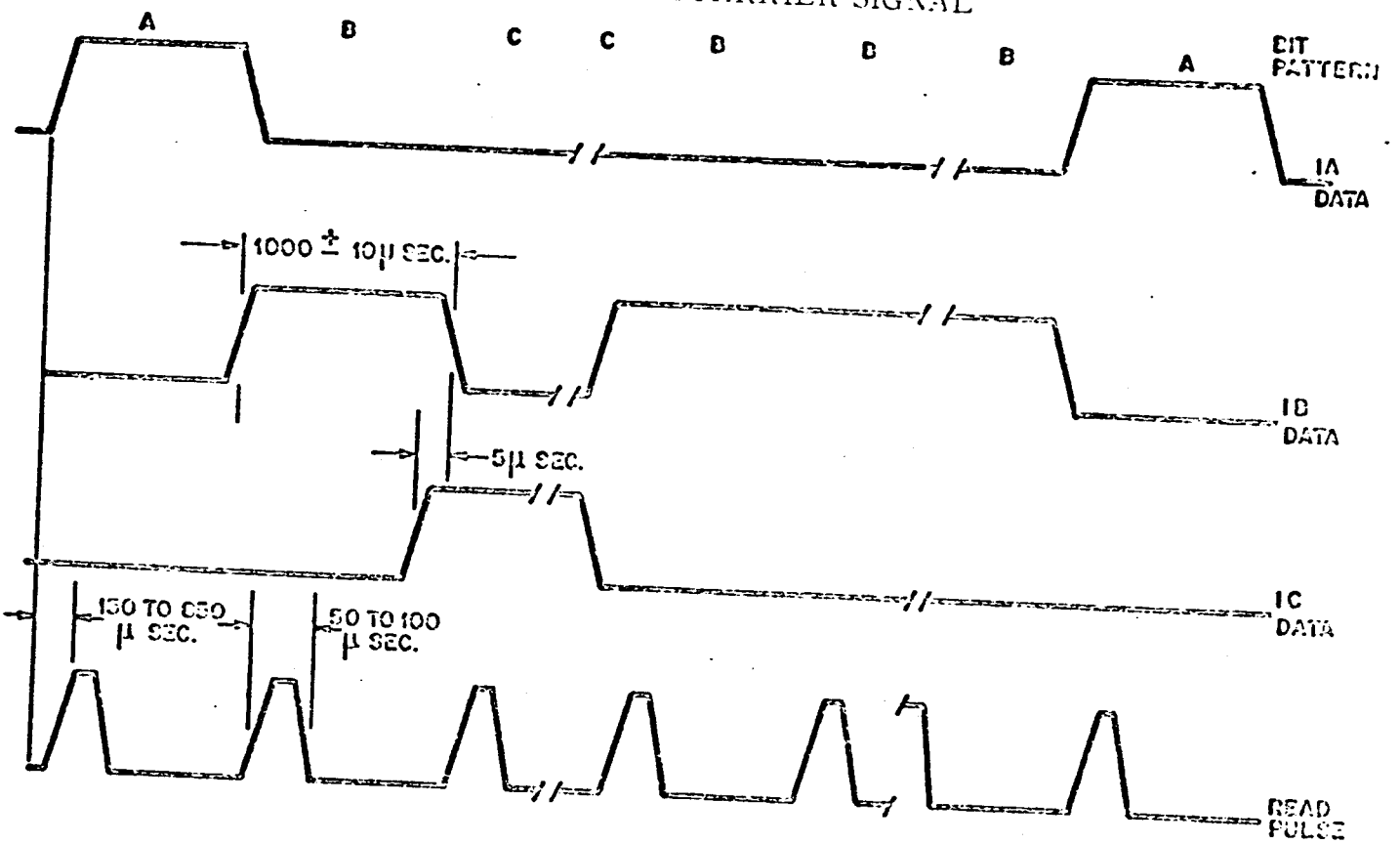


Figure B-23 SGLE & UHF Command System



A - TYPICAL FSK SUBCARRIER SIGNAL



B - DIGITAL COMMAND DATA SYNCHRONIZATION

(Data Output Lines 1A, 1B, 1C)

GROUP Y

Figure B-26

EXPLOSIVE FOUND / AUTOMATIC

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

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The command relay J-box receives 28V unregulated power whenever the SILO command system receives power. Telemetry monitors provided by this relay J-box include: (1) Digital decoder temperature, (2) Receiver Tone demodulator temperature, and (3) Command relay J-box temperature.

B-7.2.1.2 KIK-SILO Command Link

The KIK-SILO command link utilizes the above receiver demodulator in conjunction with Type 9 decoders (See Figure B-23). The Type 9 decoder processes a 35-bit word known as a KIK-SILO command. The Type 9 decoder is used in the SILO command system to provide a one time secure command execute. The transmission rate for the KIK-SILO command is limited to 20 bits per second.

The arrangement of the ones and zeros in each command is determined by a classified plug which is inserted in the encoder. Only the one vehicle which contains a duplicate plug will be capable of decoding that particular command.

Upon execution of the command, the encoder starts to formulate the command word in accordance with the wiring of the plug, starting the command with a reset and putting in the ones and zeros where required. This command word is fed into the radar which translates the resets, ones, and zeros into specific subcarriers. These signals are transmitted to the vehicle at a 20 bit per second rate. To transmit one secure command requires 1.6 second.

After receipt in the satellite, the radar transmission goes through the receiver-demodulator in which the one, zero, and reset bits are separated and identified on each of three lines as a square pulse. These three lines go into one or more Type 9 decoders wired with parallel inputs. Each Type 9 decoder decodes one 35 bit command only. A code plug is inserted in each of these decoders before launch. The plug determines the pattern of the command which it will decode. Upon receipt of a valid command, a relay in the Type 9 decoder is actuated to initiate required action in the satellite.

KIK-SILO 36 and 37 are used to enable the recovery sequences of SRV A and SRV B. KIK-SILO 38 and 39 are supplied to the A/P interface for early SRV A to SRV B transfer. They must be secure, since premature transmission would abort or shorten the mission. KIK-SILO 38 and 39 are enabled shortly after injection into orbit by the Standard Timer. The actual commands when transmitted exist from the time they are sent until power is removed from the Type 9 decoders at "fade". The command link is illustrated in Figure B-28 in the original text.

B-7.2.1.3 UNCLE Command Link

The UNCLE command link is a digital command system using a Receiver/Tone demodulator, which receives a UHF phase-modulated carrier. The RF carrier is modulated in binary format by any of four audio tones having discrete frequencies over a range of 0-15 KHz.

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The Receiver/Tone demodulator, processes messages with binary digit rates of 1 to 1000 bits per second. The tone demodulator first converts the command message from a serial train of tones into discrete binary digits. The binary digits are matrixed to seven output lines. In accordance with each tone used, the binary digits are known as "S", "Zero", "One", and "R" digits. As each tone bit is demodulated, an S, 1, or 0 digit is matricized to an output line (R is a repeat of either Zero, One or S).

Seven output lines connect the tone demodulator to either the Type 9 decoder or the digital command decoder Type 22 for further processing. Three lines (1, 2, and 2) go to the Type 9 decoder to supply basic message (negative true logic) information as S, 1, or 0 digital signals.

Four lines (4, 5, 6 and 7) go to the Digital Decoder to supply basic message (positive true logic) information as S, 1, or 0 digital signals and clock pulse. The clock pulse is developed at a discrete time during which a digit pulse (S, 1, or 0) is being sent. The discrete time interval is 25 millisec following the leading edge of the logic pulse and lasts 45 millisec. The clock pulse signals the digital command decoder to read each pulse (S, 1, or 0) of the pulse train received. Duration of each pulse in the pulse train is 650 microsec.

A telemetry monitor is provided from the vehicle receiver. Conditioning of the S, 1, and 0 digits is provided in the command relay J-box. The receiver/tone demodulator also serves as a command wake-up system. Upon receipt of S tones, 28V is applied to the Type 9 decoders through an internal relay closure. Concurrently, a solid state switch activates the Type 22 decoder. This power is removed from the decoders two seconds after the last tone transmission.

The UNCLE link, as the SILO link, utilizes the binary data from the recorder demodulator as inputs to the decoder Type 22 (39 unsecure commands) and to three Type 9 decoders (3 secure commands). Refer to Figure B-24 in the original text for UNCLE Command format.

B-7.2.1.4 KIK-UNCLE Command Link

This link utilizes the UHF receiver demodulator Type 2 and the Type 9 decoders (See Figure B-23). The decoder Type 9 outputs are secure commands utilized for Lifeboat (secondary recovery system) or SILO command/ tracking/telemetry link ON.

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

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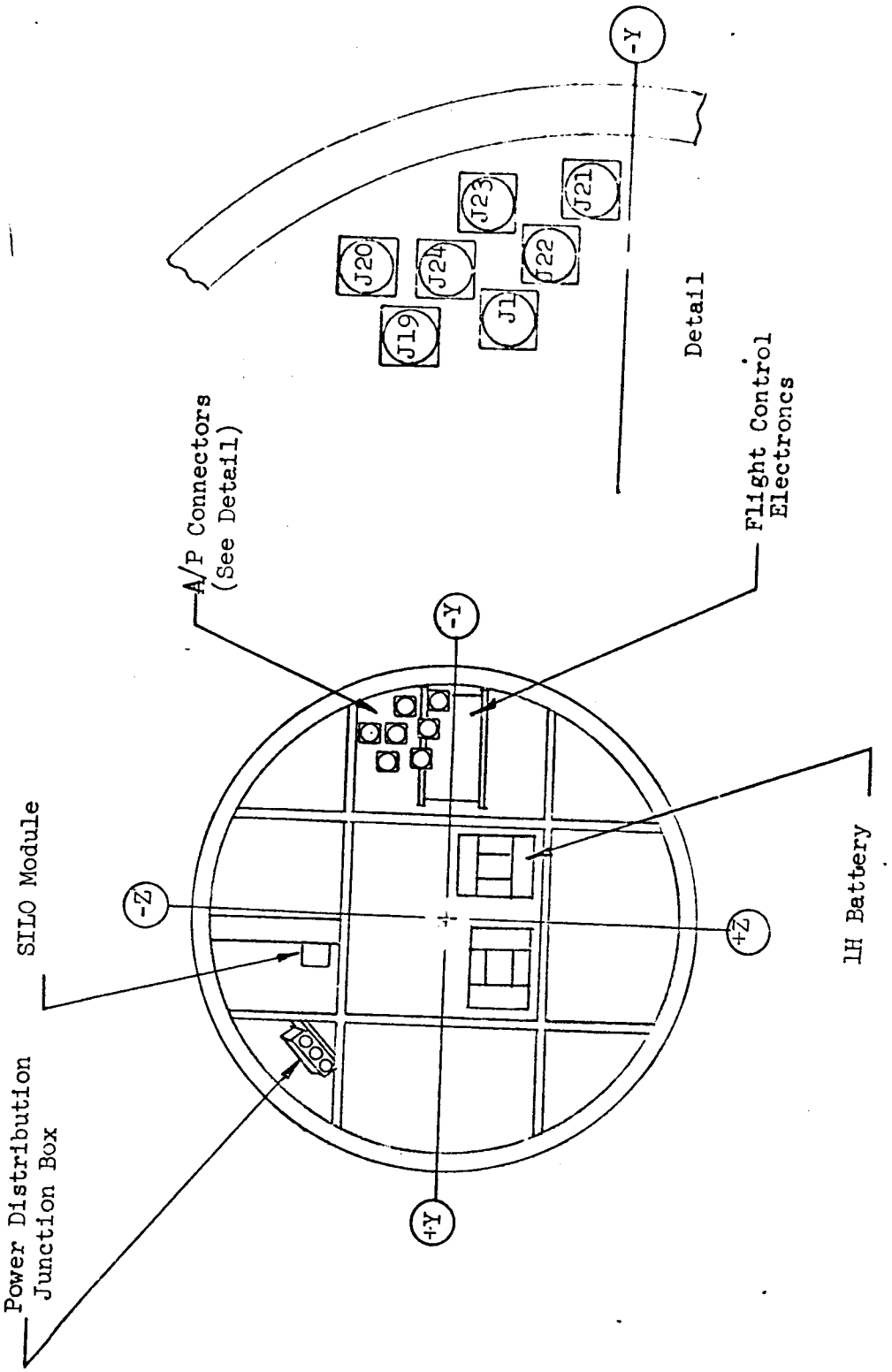

Figure B-22 Interface Electrical Connector Location

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TABLE B-8

TYPICAL SEQUENCE OF RECOVERY EVENTS

Event	Time Secs.	Function
		Start Recovery Timer (By Orbital Programmer Event or Lifeboat Timer)
1	0	Apply power to "AP Power Relay", "AP Mode Command" to Research Payload and pneumatics to high pressure.
2	2	Reset Monitor, Flight Control to Ascent Mode, remove Horizon Sensor signals, stop gyro compassing, switch IRP gyro TLM to Ascent Mode, apply -120°/min. pitch rate and remove -4°/min. pitch rate.
3	6	Arm signal, remove pneumatics to high pressure power, remove power from "AP Power Relay", disable recovery enable relay.
4	8	Remove recovery timer start power.
5	65	Apply -4°/min. pitch rate and remove -120°/min. pitch rate (pitch over -120°).
6	81	Transfer signal.
7	82	Disconnect signal.
8	83	Separation signal.
9	87	Apply +120°/min. pitch rate and remove -4°/min. pitch rate. Reset AP recovery enable and apply DMU logic power.
10	100	Remove AP power and "AP Mode Command" to research payloads and pneumatics to low pressure.
11	110	Spare
12	145	Apply -4°/min. pitch rate and remove +120°/min. pitch rate (pitch up to 120°), flight control to orbit mode, connect Horizon Sensor gyros, start gyro-compassing, switch IRP gyros TLM to orbit mode and remove pneumatics to low pressure.
13	154	Reset recovery timer.
14	600	Remove recovery timer power and arm UNCLE 114 and 115/SILO 314 and 315 commands.

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TABLE B-9

SEQUENCE OF EVENTS, LIFEBOAT MODES U1 AND U2

Event	*Time	Function ----U1 Mode	Function ----U2 Mode
T_0	0	Lockout timer restart Disable start command	Lockout timer restart Disable start command
T_1	25	AP recovery enable DMU disable	AP recovery enable DMU disable
T_2	30	Remove T_1 event power	Remove T_1 event power
T_3	5060	Link 1, Flight control electronics, and magnometer ON and start A sequence.	Link 1, Flight control electronics, and magnometer ON and start A sequence.
T_4	5355	Primary pneumatics OFF	No effect
T_5	5360	L/B pneumatic ON RP TLM to AP mode L/B power ON.	No effect
T_6	5380	Arm	Start recovery timer B sequence
T_7	5455	Transfer	No effect
T_8	5456	Disconnect	No effect
T_9	5457	Separate	No effect
T_{10}	5545	Lifeboat reset	Lifeboat reset
T_{11}	5550	Enable DMU	Remove recovery timer, start signal, enable DMU
T_{12}	5560	Timer reset to B sequence	Reset B sequence
T_A	5660	Link 1 OFF (T_3 & T_A)	Link 1 OFF

*Seconds

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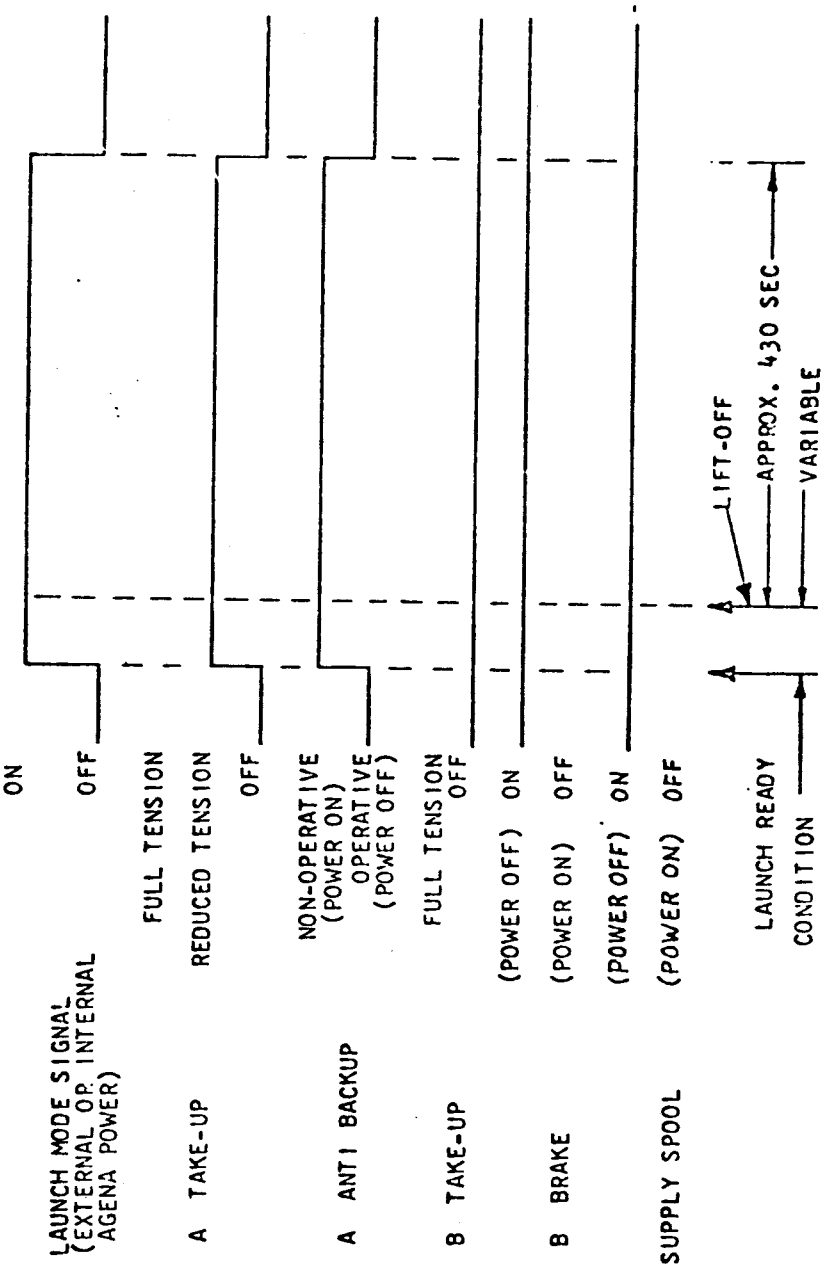

Figure F-7 Launch Mode Sequence

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

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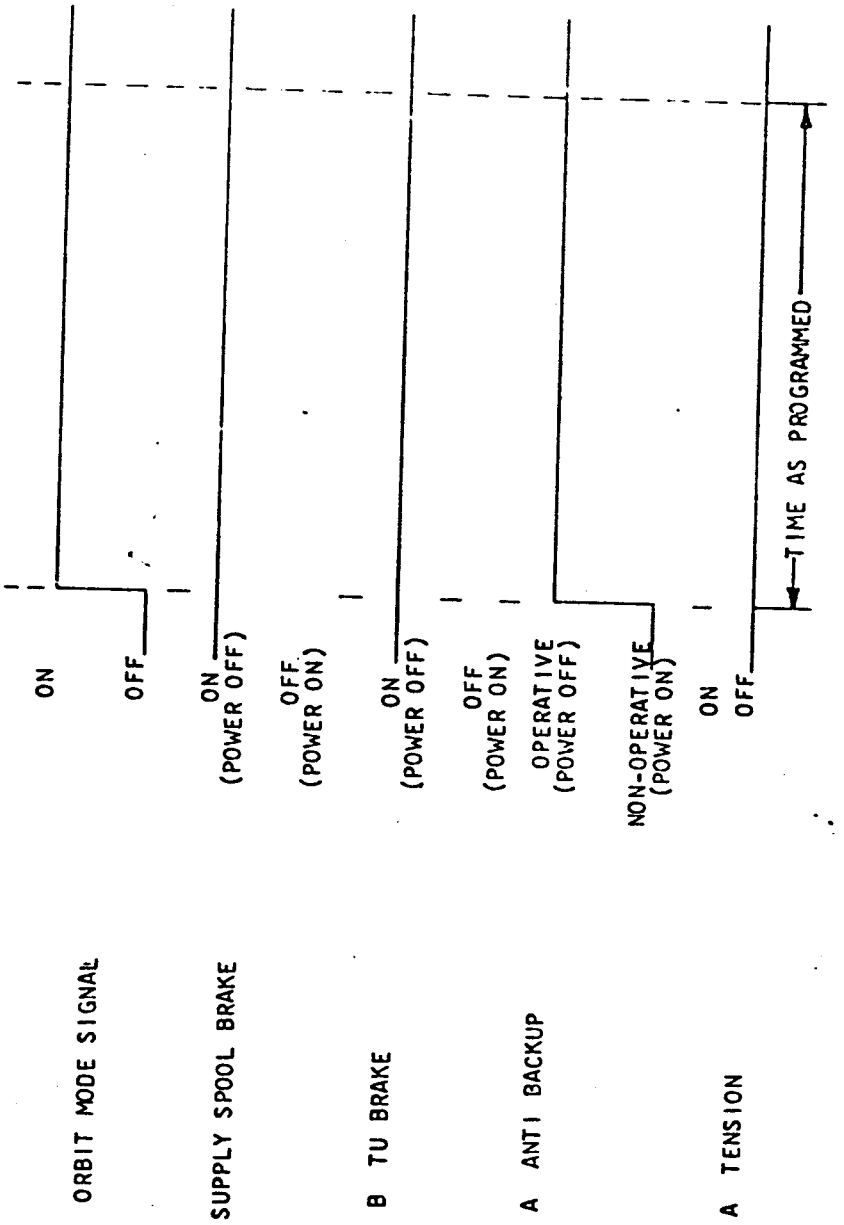

Figure F-8 Stand-By (Orbit) Mode Sequence

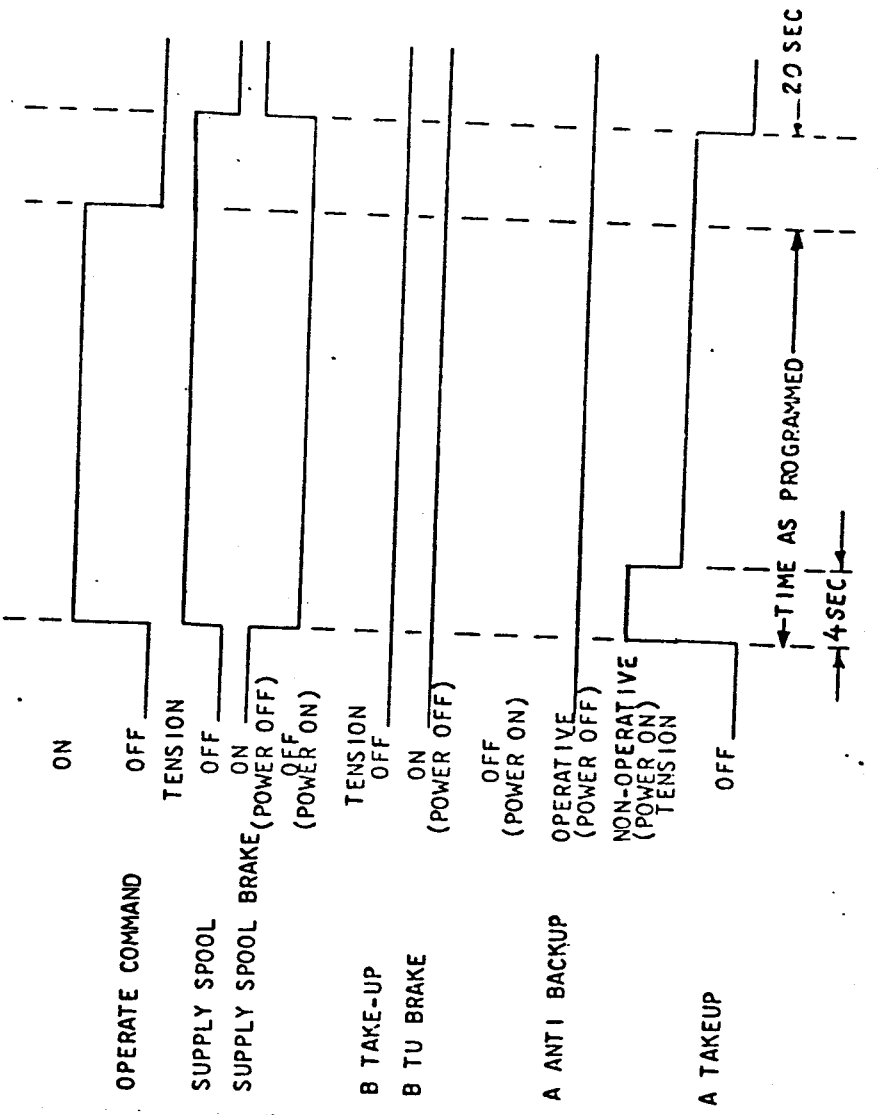

Figure F-9 "A" Operate Mode

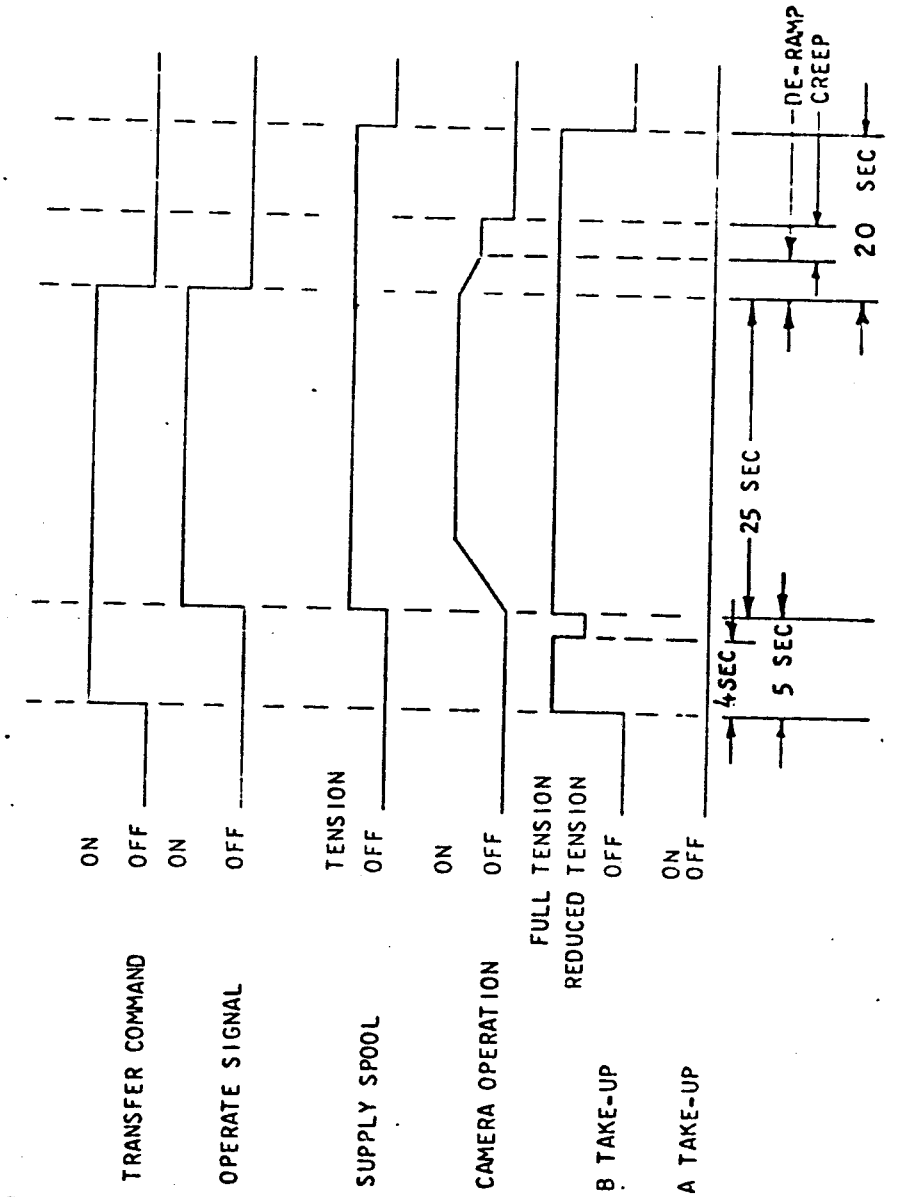

Figure F-10 A-to-B Transfer Sequence

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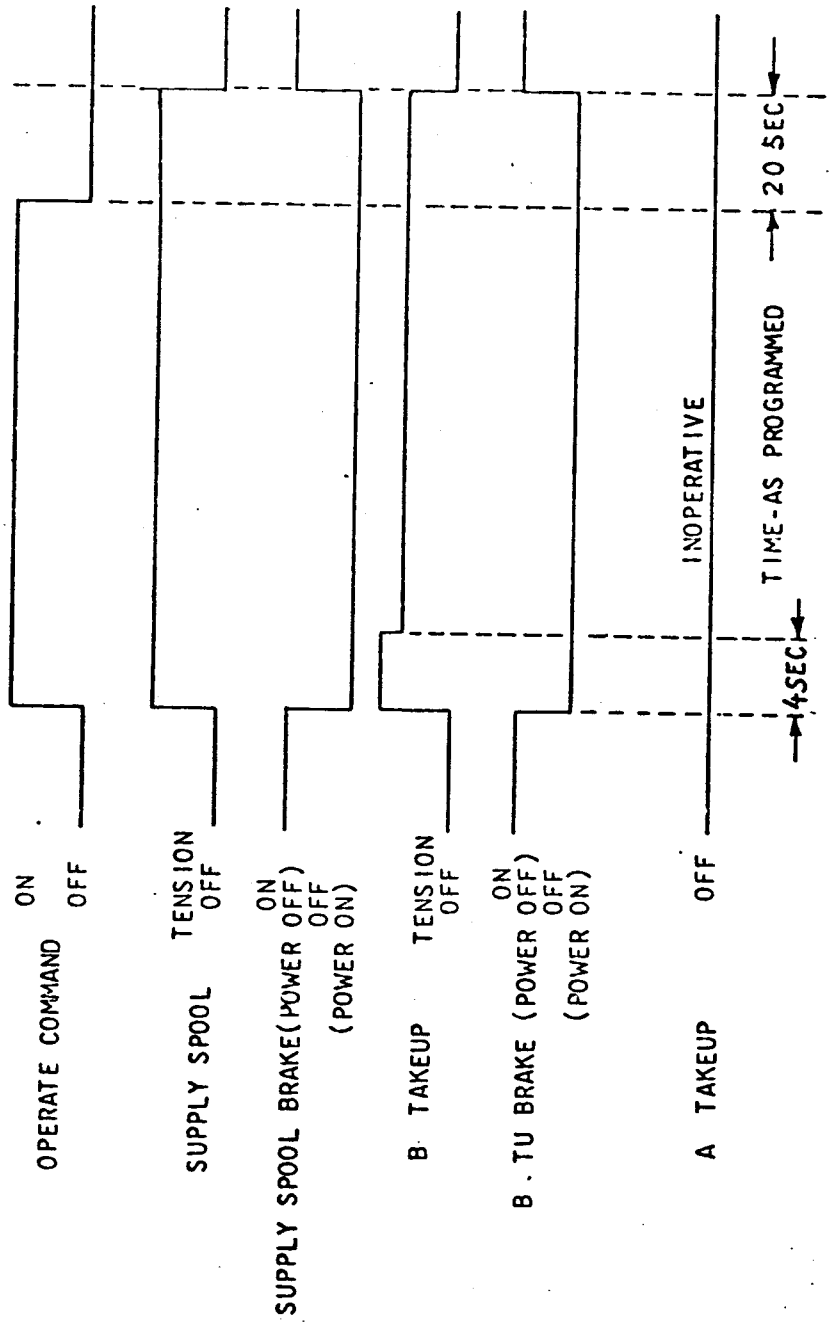

Figure F-11 "B" Operate Mode

TABLE F-2 CR INSTRUMENT MONITORS

DESIGNATION OF VEH. OR P/L FUNCTION	INSTRUMENT FUNCTION	TRANSDUCER TYPE	LOCATION
AP UMB. Mon. No. 6	Pad Temp Monitor	Silicon Chip Resistance	Delta Structure
Commutator I Ring B LK I Ch 11	Temp Sensors (8) Instrument No. 1	Silicon Chip Resistance	Lens Cell Lens Cone Rear Rail Rt. Aux. Optics Drive Motor Front Rail Drum Support Hi Efficiency Amplifier
Commutator 1 Ring B LK I Ch 11	Temp Sensors (8) Instrument No. 2	Silicon Chip Resistance	Lens Cell Lens Cone Rear Rail Rt. Aux. Optics Drive Motor Front Rail Supply Cass. Delta Struct.
Commutator 1 Ring A LK I Ch 13	Pan & DISIC Terrain Door Separate	Switch	Door Frame
	Pan No. 1 Take-Up Diameter	Pot	T/U No. 1
	Pan No. 2 Take-Up Diameter	Pot	T/U No. 2
	Pan No. 1 Cycle Counter (3 Points)	Elec. Digital Readout	Instr. No. 1
	Pan No. 2 Cycle Counter (3 Points	Elec. Digital Readout	Instr. No. 2
	Pan No.1& No. 2 Slit-Width Fail-Safe Position	Pot	Instruments No. 1 & No. 2
	Pan No. 1 & No. 2 Exposure Control (2 Points)	Elec. Digital Readout	Instruments No. 1 & No. 2
	Pan No. 1 Filter Position	Pot	Instr. No. 1
	Pan No. 2 Filter Position	Pot	Instr. No. 2

[redacted]

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APPENDIX FF

TABLE F-2 CR INSTRUMENT MONITORS

DESIGNATION OF VEH. OR P/L FUNCTION	INSTRUMENT FUNCTION	TRANSDUCER TYPE	LOCATION
Commutator II Ring B LK II Ch 15	Pan No. 1 & No. 2 Film Change Detector	Pot	Instr. No. 1 & No. 2
	SRV "A" Water Seal	Switch	Capsule Cover
	SRV "B" Water Seal	Switch	Capsule Cover
	Pan No. 1 Input Meter Rotation	Pot	Instr. No. 1
	Pan No. 2 Input Meter Rotation	Pot	Instr. No. 2
	Pan No. 1 Frame Meter Rotation	Pot	Instr. No. 1
	Pan No. 2 Frame Meter Rotation	Pot	Instr. No. 2
	Pan No. 1 Take-up Voltage A & B	Pot	T/U No. 1 (A & B)
	Pan No. 2 Take-up Voltage A & B	Pot	T/U No. 2 (A & B)
	Pan No. 1 H/O Platten Positions	Switch	H/O
	Pan No. 2 H/O Platten Positions	Switch	H/O
	Pan No. 1 H/O Platten & Shutter Command	Isolation Amplifier	Instr. No. 1
	Pan No. 2 H/O Platten & Shutter Command	Isolation Amplifier	Instr. No. 2
	Pan No. 1 Drive Motor Voltage-Fwd	Isolation Amplifier	Instr. No. 1
	Pan No. 2 Drive Motor Voltage-Fwd	Isolation Amplifier	Instr. No. 2

SUPPLEMENT TO THE TRAINING MANUAL

APPENDIX F

TABLE F-2 CR INSTRUMENT MONITORS

DESIGNATION OF VEH. OR P/L FUNCTION	INSTRUMENT FUNCTION	TRANSDUCER TYPE	LOCATION
Commutator II Ring B LK II Ch 15	Pan No. 1 Drive Motor Voltage-Rev.	Isolation Amplifier	Instr. No. 1
	Pan No. 2 Drive Motor Voltage-Rev.	Isolation Amplifier	Instr. No. 2
	Pan No. 1 Tach Feedback Voltage	Isolation Amplifier	Instr. No. 1
	Pan No. 2 Tach Feedback Voltage	Isolation Amplifier	Instr. No. 2
	Pan No. 1 Operate Voltage	Isolation Amplifier	Istr. No. 1
	Pan No. 2 Operate Voltage	Isolation Amplifier	Instr. No. 2
	Pan No. 1 Supply Spool Motor Voltage	Isolation Amplifier	Supply Spool
	Pan No. 2 Supply Spool Motor Voltage	Isolation Amplifier	Supply Spool
	Pan No. 1 Supply Spool Bobber Position	Pot	Supply Spool
	Pan No. 2 Supply Spool Bobber Position	Pot	Supply Spool
	Pan No. 1 Slit Width Position	Pot	Instr. No. 1
	Pan No. 2 Slit Width Position	Pot	Instr. No. 2

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

APPENDIX F

TABLE F-2 OR INSTRUMENT MONITORS

DESIGNATION OF VEH. OR P/L FUNCTION	INSTRUMENT FUNCTION	TRANSMISSION TYPE	LOCATION
AP 5 LK 1 Ch 5	Pan No. 1 Lens Angular Position	Pot	Instr. No. 1
AP 6 LK 1 Ch 5	Pan No. 2 Lens Angular Position	Pot	Instr. No. 2
AP 5 LK 1 Ch 5	Pan No. 1 Center of Format Command	Isolation Amplifier	Instr. No. 1
AP 6 LK 1 Ch 6	Pan No. 2 Center of Format Command	Isolation Amplifier	Instr. No. 2
AP 9 LK 1 Ch 9	Pan No. 1 Output Idler Rotation	Pot	Instr. No. 1
AP 10 LK 1 Ch 10	Pan No. 2 Output Idler Rotation	Pot	Instr. No. 2
AP 9 LK 1 Ch 9	Pan No. 1 99/101 Clutch Command	Isolation Amplifier	Instr. No. 1
AP 10 LK 1 Ch 10	Pan No. 2 99/101 Clutch Command	Isolation Amplifier	Instr. No. 2

[redacted]

SUPPLEMENT TO THE TRAINING MANUAL - [redacted]

APPENDIX FF

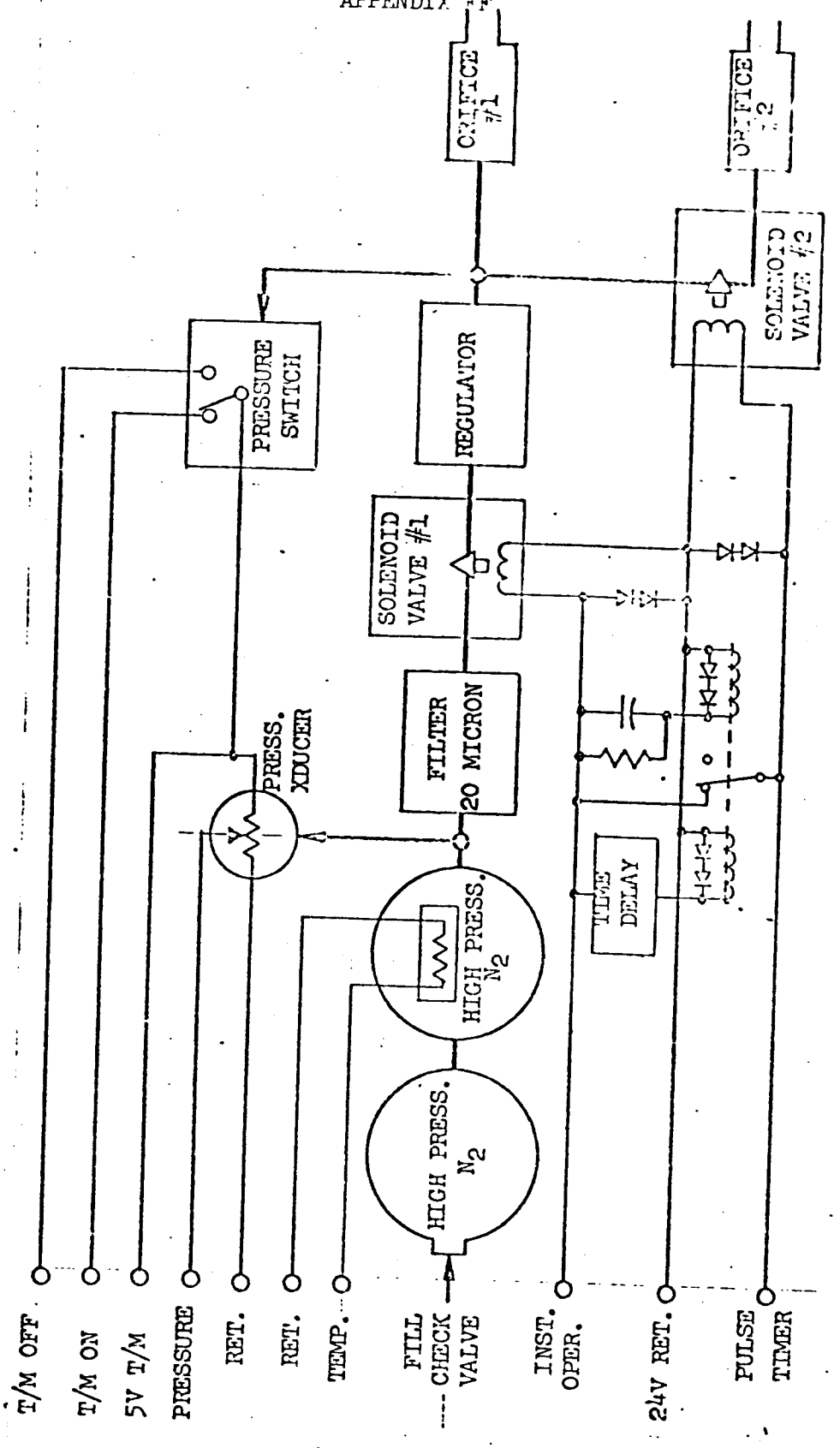

FIG K-2 PRESSURE MAKE-UP SYSTEM, FUNCTION BLOCK DIAGRAM

SUPPLEMENT TO THE TRAINING MANUAL [redacted]

APPENDIX FF

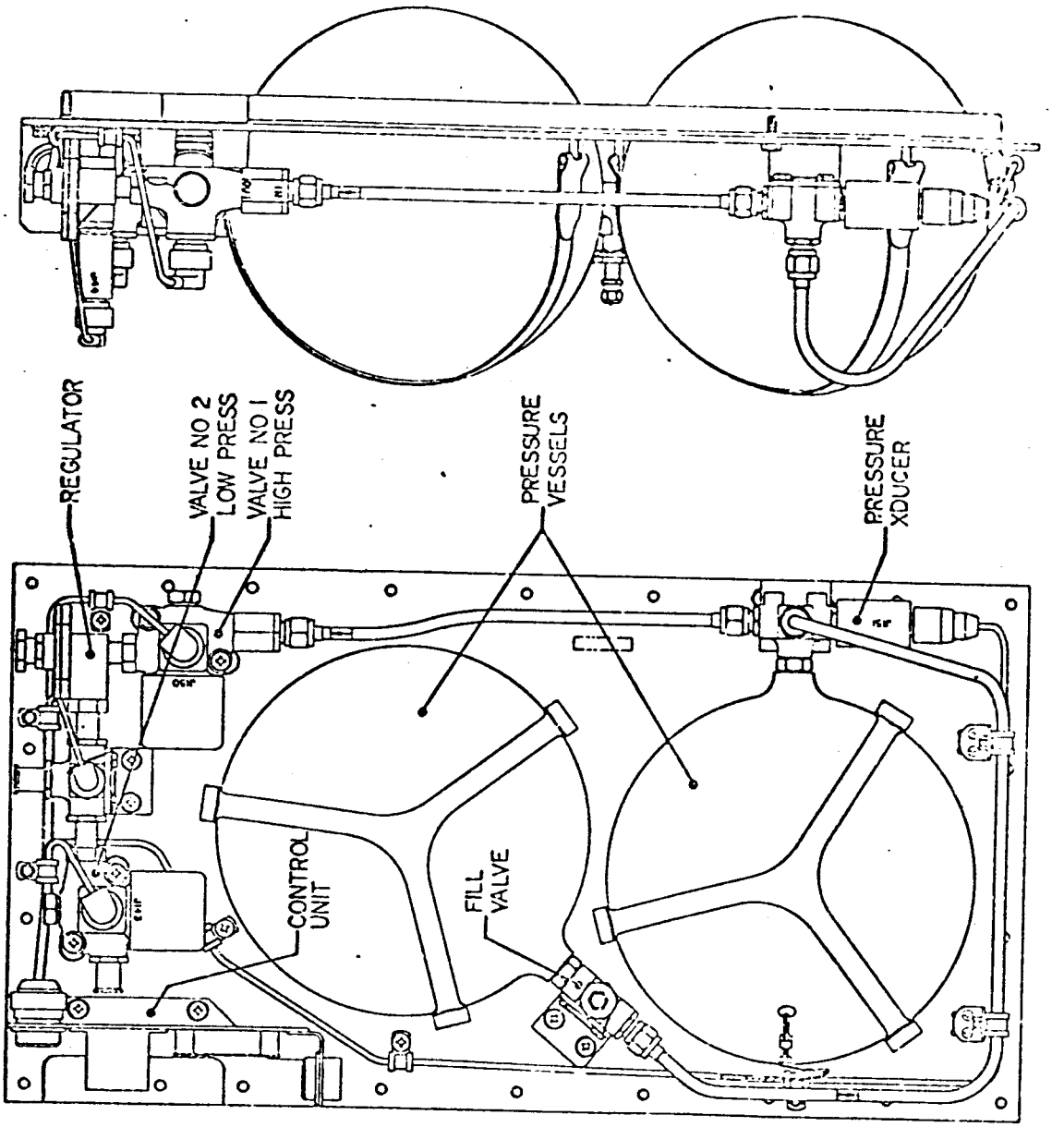

FIGURE K-3 PRESSURE MAKE-UP SYSTEM