11-168. HAND CONTROLLER MALFUNCTION DETECTOR ADJUSTMENT - Adjustment of this circuit consists in setting the positive and negative threshold amplifier, A1, potentiometers. This setting should be matched to each individual LDS switch, and therefore must be done separately for each hand controller. The adjustment is performed as follows: first monitor the LDS switch, the appropriate test point and the synchro (stick) DC voltage while slowly advancing the hand controller and determine the voltage when the LDS switch makes; call this V_1. Next, slowly decrease the hand controller back towards null and note the voltage when the LDS switch breaks; call this V_2. Add the equivalent assist value, 1.1 volts DC, to V_2 and call this V_3. Calculate the average of V_1 (make) and V_3 (break + assist) voltage and call this V_4. Finally, inject a stick signal from the test cart, leaving the hand controller at null, to obtain voltage V_4 at the appropriate test point. Adjust the appropriate threshold potentiometer to just switch amplifier A1 to ON. Perform a similar procedure for the other polarity of hand controller motion. As a check on the alignment, exercise the hand controller and observe the error voltage which should not exceed 1.5 volts peak for any stick motion. The specific adjustment potentiometers and test points are listed in table 11-4, item 22.

11-169. EXCESS RATE DETECTOR - The circuit adjustment can be performed by monitoring the output at the appropriate test point, rotating the rate gyro at the desired excess rate value, and setting the trigger adjustment potentiometer until the output voltage switches to positive 28 volts DC. The specific adjustment potentiometers and test points are listed in table 11-4, items 21 and 29.

11-170. H_2O_2 FUEL LEVEL DETECTOR ADJUSTMENT - Circuit adjustment consists of (1) nulling quiescent drift, (2) setting the lift rocket adjustment potentiometers, and (3) setting the four attitude rocket potentiometers.

Nulling the OFF or quiescent drift is done by selecting one set of rockets (STD or TEST), putting the ACS Safe switch to the FLIGHT (GUARD DOWN) position, and selecting a resistor for the T-bias network. The integrator null potentiometer is used for any subsequent drift adjustment once the fixed select resistor has been chosen. The lift rocket adjustment potentiometer is set by pressurizing the lift rocket transducer and obtaining the desired burnoff rate on the fuel remaining indicator. The attitude rocket adjustment potentiometers are set by switching to the appropriate set of rockets and pulsing the pitch channel with a 5-hertz square wave command. This alternately fires the four pitch/roll rockets and allows averaging of individual errors. By observing the fuel remaining indicator and calculating the burnoff rate, the potentiometer can be set to the desired value. A similar procedure is used in the yaw channel to adjust the two attitude rocket burnoff potentiometers. The specific adjustment potentiometers and test points are listed in table 11-4, item 23.

11-171. ELECTRONIC SWITCH ADJUSTMENT - Circuit adjustment consists of the trigger level with the trigger adjust potentiometer. The desired trigger pressure is applied to the lift rocket chamber and the 22-turn, 100-kilohm adjustment potentiometer is set to just turn amplifier A1 ON (+10.5 volts DC). The rocket chamber can then be de-pressurized and a voltage injected at the Test Cart inject test point until the amplifier just switches to ON. The inject voltage should be noted and used for future testing, therefore enabling the circuit to be checked without pressurizing the rocket chamber every time. It should be noted that the voltage from the lift rocket pressure transducer is never zero since it measures absolute pressure and indicates 14.7 psia atmospheric pressure when the lift rockets are off.

11-172. THRUST/WEIGHT COMPUTER ADJUSTMENT - The steps to adjust this circuit consist of (1) setting an initial weight, (2) nulling the divider output, and (3) zeroing the JP-4 and H_2O_2 synchronizer integrator drifts. The initial weight is adjusted by monitoring A24-TP3 and setting the desired initial weight using a scale factor of 620 lb/volt. The 250 kilohm adjustment potentiometer A24R3 gives the capability of adjusting for initial weights of 2020 to 4130 pounds. The divider output is nulled by monitoring the output amplifier, A23-TP6, figure 11-42, grounding the input V_1 or ^TL and adjust the nulling potentiometer A23R2, figure 11-42, for a minimum, less than 15 millivolts. The H_2O_2 synchronizer integrator drift is nulled by initiating Lunar Simulation and monitoring the output drift of integrator amplifier, A2 output, A22-TP4, figure 11-41, for approximately ten minutes and adjusting the H_2O_2 null adjust potentiometer A22R2, figure 11-41, to minimize the drift. The drift should be adjusted to less than 40 millivolts per minute. The JP-4 integrator can be nulled by monitoring the output at 2.0 minutes after initiation of Lunar Simulation. The JP-4 null adjust potentiometer A22R1, figure 11-41, is adjusted for 68.4 pounds or -9.75 volts at the end of 2.0 minutes.

11-173. Z-AXIS ERROR AMPLIFIER ADJUSTMENT - The adjustment consists of setting the null adjustment potentiometer, with relay K1 de-energized, as in flight, to avoid offsets from the auto throttle demodulator and feedback synchro, (figure 11-44). With the vehicle leveled to 0 $\pm$ 0.3 degrees, generate a negative 2.5 volt DC, at the input thrust/weight (lift rocket acceleration)input, and adjust the null potentiometer A6R1 to obtain less than 100-millivolts DC, at A5A-TP2. This error signal should be recorded over a 15-minute period and averaged about zero, since the vertical gyro will be drifting $\pm$ 0.5 degrees within its vertical accuracy cone and creating a very low frequency $\pm$ 0.24 volts DC, peak-to-peak wandering signal at A5A-TP2.

11-174. X-AXIS ERROR AMPLIFIER ADJUSTMENT - Circuit adjustment consists of setting the null adjustment potentiometer, with relay K1 de-energized, as in flight, to avoid offsets from the engine angle potentiometer (figure 11-43). With the vehicle leveled to $0^{\circ} \pm 18$ minutes, adjust the potentiometer A9R1 (Y-axis) or A9R2 (X-axis) to obtain less than 100 millivolts DC at A14A-TP6 (Y-axis) or A10A-TP1 (X-axis). This error signal should be recorded over a fifteen minute period and averaged about zero, since the vertical gyro will be drifting $\pm$ 0.5 degrees within its vertical cone and creating a very low frequency $\pm$ 0.24 volts DC, peak-to-peak wandering signal at appropriate test point.

11-175. COMPENSATION NETWORK AND INTEGRATOR ADJUSTMENT - Circuit adjustment consists of setting the Null Adjustment potentiometer to obtain zero drift at the integrator output. Place the Jet Stabilization System in Engine Centered or Local Vertical mode, zero the signal at A12B-TP1 and adjust the null adjust potentiometer to obtain minimum drift at the integrator output. Since the drift is low, the output should be observed for about a ten-minute sample time.

Table 11-4. Avionics Adjustments Data Sheet

ITEM	ACTION	CHANNEL (AXIS)	ADJUSTMENT POT	TEST POINT			VOLTAGE
				BOX	P.C. CARD	T.P.	
1	Primary - Rate Command Null Adjustment.						
	Place Hand Controller in center neutral position	Pitch	-	050	A1	TP7	NULL
		Roll	-	050	A14	TP7	NULL
		Yaw	-	050	A16	TP7	NULL
	Adjust Rate Command Null Pot for Null at Specified Test Point.	Pitch	050 A1 R1	050	A2	TP2	0 vdc
		Roll	050 A14 R1	050	A12	TP2	0 vdc
		Yaw	050 A16 R1	050	A17	TP2	0 vdc
2	Primary - Rate Gyro Null Adjustment.						
	Adjust Rate Feedback Scaling Pot fully CW	Pitch	050 A1 R4		-		-
		Roll	050 A14 R4		-		-
		Yaw	050 A16 R4		-		-
	Adjust Rate Feedback Null Pot for Null at Specified Test Point	Pitch	050 A1 R2	050	A2	TP6	0 vdc
		Roll	050 A14 R2	050	A12	TP6	0 vdc
		Yaw	050 A16 R2	050	A17	TP6	0 vdc
3	Primary - Attitude Gyro Null Adjustment						
	Adjust Vertical Gyro for Zero Attitude Indication	Pitch					
		Roll					
		Yaw					
	Adjust Attitude Circuit Scaling Pot fully CW	Pitch	050 A4 R3		-		-
		Roll	050 A10 R3		-		-
		Yaw	050 A19 R3		-		-
	Adjust Attitude Null Pot for Null at Specified Test Point	Pitch	050 A4 R1	050	A4	TP3	0 vdc

Table 11-4. Avionics Adjustments Data Sheet (Continued)

ITEM	ACTION	CHANNEL (AXIS)	ADJUSTMENT Pot	TEST POINT BOX	TEST POINT P.C. CARD	TEST POINT T.P.	VOLTAGE
4	Primary - Rate Command Scale Factor Adjustment						
	Adjust the Hand Controller (Stick)Command to 20°/S max Rate	Pitch	-	H.C.	Output		2.8 vrms
		Roll	-	H.C.	Output		2.8 vrms
		Yaw	-	H.C.	Output		2.8 vrms
	Adjust the Rate Command Scaling Pot to fully CCW	Pitch	050 A1 R3	050	A1	TP7	0 vac
		Roll	050 A14 R3	050	A14	TP7	0 vac
		Yaw	050 A16 R3	050	A16	TP7	0 vac
	Adjust the Rate Command Scaling Pot for 500 mv/°/S Scale Factor	Pitch	050 A1 R3	050	A2	TP2	+10.0 vdc
		Roll	050 A14 R3	050	A12	TP2	+10.0 vdc
		Yaw	050 A16 R3	050	A17	TP2	+10.0 vdc
5	Primary - Rate Gyro Circuit Scale Factor Adjustment						
	Adjust Rate Gyro Signal for 20°/S Rate Feedback	Pitch	-	Rate	Gyro		3.0 vrms
		Roll	-	Rate	Gyro		3.0 vrms
		Yaw	-	Rate	Gyro		3.0 vrms
	Adjust the Rate Feedback Scaling Pot to fully CCW	Pitch	050 A1 R4	050	A1	TP6	0 vac
		Roll	050 A14 R4	050	A14	TP6	0 vac
		Yaw	050 A16 R4	050	A16	TP6	0 vac
	Adjust the Rate Feedback Scaling Pot for 500 mv/°/S Scale Factor	Pitch	050 A1 R4	050	A2	TP6	-10.0 vdc
		Roll	050 A14 R4	050	A12	TP6	-10.0 vdc
		Yaw	050 A16 R4	050	A17	TP6	-10.0 vdc
6	Primary - Attitude Gyro Circuit Scale Factor Adjustment						
	Adjust vertical gyro signal for 40° Attitude indication.	Pitch	-	Vert	Gyro		7.6 vrms

Table 11-4. Avionics Adjustments Data Sheet

ITEM	ACTION	CHANNEL (AXIS)	ADJUSTMENT POT	TEST POINT			VOLTAGE
				BOX	P.C. CARD	T.P.	
1	Primary - Rate Command Null Adjustment.						
	Place Hand Controller in center neutral position	Pitch	-	050	A1	TP7	GND
		Roll	-	050	A14	TP7	GND
		Yaw	-	050	A16	TP7	GND
	Adjust Rate Command Null Pot for Null at Specified Test Point.	Pitch	050 A1 R1	050	A2	TP2	0 vdc
		Roll	050 A14 R1	050	A12	TP2	0 vdc
		Yaw	050 A16 R1	050	A17	TP2	0 vdc
2	Primary - Rate Gyro Null Adjustment.						
	Adjust Rate Feedback Scaling Pot fully CW	Pitch	050 A1 R4		-		-
		Roll	050 A14 R4		-		-
		Yaw	050 A16 R4		-		-
	Adjust Rate Feedback Null Pot for Null at Specified Test Point	Pitch	050 A1 R2	050	A2	TP6	0 vdc
		Roll	050 A14 R2	050	A12	TP6	0 vdc
		Yaw	050 A16 R2	050	A17	TP6	0 vdc
3	Primary - Attitude Gyro Null Adjustment						
	Adjust Vertical Gyro for Zero Attitude Indication	Pitch					
		Roll					
		Yaw					
	Adjust Attitude Circuit Scaling Pot fully CW	Pitch	050 A4 R3		-		-
		Roll	050 A10 R3		-		-
		Yaw	050 A19 R3		-		-
	Adjust Attitude Null Pot for Null at Specified Test Point	Pitch	050 A4 R1	050	A4	TP3	0 vdc

Table 11-4. Avionics Adjustments Data Sheet (Continued)

ITEM	ACTION	CHANNEL (AXIS)	ADJUSTMENT Pot	TEST POINT BOX	TEST POINT P.C. CARD	TEST POINT T.P.	VOLTAGE
4	Primary - Rate Command Scale Factor Adjustment						
	Adjust the Hand Controller (Stick) Command to 20°/S max Rate	Pitch	-	H.C.	Output		2.8 vrms
		Roll	-	H.C.	Output		2.8 vrms
		Yaw	-	H.C.	Output		2.8 vrms
	Adjust the Rate Command Scaling Pot to fully CCW	Pitch	050 A1 R3	050	A1	TP7	0 vac
		Roll	050 A14 R3	050	A14	TP7	0 vac
		Yaw	050 A16 R3	050	A16	TP7	0 vac
	Adjust the Rate Command Scaling Pot for 500 mv/°/S Scale Factor	Pitch	050 A1 R3	050	A2	TP2	+10.0 vdc
		Roll	050 A14 R3	050	A12	TP2	+10.0 vdc
		Yaw	050 A16 R3	050	A17	TP2	+10.0 vdc
5	Primary - Rate Gyro Circuit Scale Factor Adjustment						
	Adjust Rate Gyro Signal for 20°/S Rate Feedback	Pitch	-	Rate	Gyro		3.0 vrms
		Roll	-	Rate	Gyro		3.0 vrms
		Yaw	-	Rate	Gyro		3.0 vrms
	Adjust the Rate Feedback Scaling Pot to fully CCW	Pitch	050 A1 R4	050	A1	TP6	0 vac
		Roll	050 A14 R4	050	A14	TP6	0 vac
		Yaw	050 A16 R4	050	A16	TP6	0 vac
	Adjust the Rate Feedback Scaling Pot for 500 mv/°/S Scale Factor	Pitch	050 A1 R4	050	A2	TP6	-10.0 vdc
		Roll	050 A14 R4	050	A12	TP6	-10.0 vdc
		Yaw	050 A16 R4	050	A17	TP6	-10.0 vdc
6	Primary - Attitude Gyro Circuit Scale Factor Adjustment						
	Adjust vertical gyro signal for 40° Attitude indication.	Pitch	-	Vert	Gyro		7.6 vrms

Table 11-4. Avionics Adjustments Data Sheet (Continued)

ITEM	ACTION	CHANNEL (AXIS)	ADJUSTMENT POT	TEST POINT BOX P.C. T.P. CARD	VOLTAGE
		Roll	-	Vert. Gyro	7.6 vrms
		Yaw	-	Vert. Gyro	7.6 vrms
	Adjust Attitude Circuit Scaling				
	Pot fully CCW	Pitch	050 A4 R3	050 A4 TP7	0 vac
		Roll	050 A10 R3	050 A10 TP7	0 vac
		Yaw	050 A19 R3	050 A19 TP7	0 vac
	Adjust Attitude Circuit Scaling				
	Pot for: 200 mv/° Scale Factor	Pitch	050 A4 R3	050 A4 TP3	-8.0 vdc
	200 mv/° Scale Factor:	Roll	050 A10 R3	050 A10 TP3	-8.0 vdc
	200 mv/° Scale Factor	Yaw	050 A19 R3	050 A19 TP4	-6.55 vdc
7	Monitor - Rate Command NULL Adjustment				
	Place Hand Controller in center				
	neutral position	Pitch	-		
		Roll	-		
		Yaw	-		
	Adjust Rate Command Null Pot				
	for null at specified test point	Pitch	070 A2 R1	070 A1 TP2	0 vdc
		Roll	070 A6 R1	070 A7 TP2	0 vdc
		Yaw	070 A9 R1	070 A10 TP2	0 vdc
8	Monitor - Rate Gyro Feedback Circuit Null Adjustment				
	Adjust Rate Feedback Scaling				
	Pot fully CW	Pitch	070 A2 R3	-	-
		Roll	070 A6 R3	-	-
		Yaw	070 A9 R3	-	-
	Adjust Rate Feedback Null Pot				
	for null at specified test point	Pitch	070 A2 R2	070 A2 TP1	0 vdc
		Roll	070 A6 R2	070 A6 TP1	0 vdc
		Yaw	070 A9 R2	070 A9 TP1	0 vdc
9.	Monitor - Rate Command Scale Factor Adjustment				
	Adjust the Hand Controller				
	Command to 20°/S Max Rate	Pitch	-	H.C.Output	2.8 vrms

Table 11-4. Avionics Adjustments Data Sheet (Continued)

ITEM	ACTION	CHANNEL (AXIS)	ADJUSTMENT POT	TEST POINT			VOLTAGE
				BOX	P.C. CARD	T.P.	
		Roll	-	H.C.	Output		2.8 vrms
		Yaw	-	H.C.	Output		2.8 vrms
	Adjust the Rate Command Scaling Pot to fully CCW	Pitch	070 A2 R3	070	A2	TP7	0 vac
		Roll	070 A6 R3	070	A6	TP7	0 vac
		Yaw	070 A9 R3	070	A9	TP7	0 vac
	Readjust the Rate Command Scaling Pot for 500 mv/°/S Scale Factor	Pitch	070 A2 R3	070	A1	TP2	+10 vdc
		Roll	070 A6 R3	070	A7	TP2	+10 vdc
		Yaw	070 A9 R3	070	A10	TP2	+10 vdc
10	Monitor - Rate Gyro Feedback Circuit Scale Factor Adjustment						
	Adjust Rate Gyro Signal for 20°/S Rate Feedback	Pitch	-				3.0 vrms
		Roll	-				3.0 vrms
		Yaw	-				3.0 vrms
	Adjust the Rate Feedback Scaling Pot to fully CCW	Pitch	070 A2 R4	070	A2	TP6	0 vac
		Roll	070 A6 R4	070	A6	TP6	0 vac
		Yaw	070 A9 R4	070	A9	TP6	0 vac
	Adjust the Rate Feedback Scaling Pot for 500 mv/°/S Scale Factor	Pitch	070 A2 R4	070	A1	TP6	-10 vdc
		Roll	070 A6 R4	070	A7	TP6	-10 vdc
		Yaw	070 A9 R4	070	A10	TP6	-10 vdc
11	Primary - Rate Threshold Circuit Adjustment Procedure						
	Place Hand Controller in Center neutral position	Pitch	-	050	A1	TP7	0 vac
		Roll	-	050	A14	TP7	0 vac
		Yaw	-	050	A16	TP7	0 vac
	Adjust Rate Gyro signal to zero	Pitch	-	050	A1	TP6	0 vac
		Roll	-	050	A14	TP6	0 vac
		Yaw	-	050	A16	TP6	0 vac

ITEM	ACTION	CHANNEL (AXIS)	ADJUSTMENT POT	TEST POINT BOX	TEST POINT P.C. CARD	TEST POINT T.P.	VOLTAGE
	Adjust the Attitude Gyro signal to zero.	Pitch	-	050	A4	TP7	0 vac
		Roll	-	050	A10	TP7	0 vac
		Yaw	-	050	A19	TP6	0 vac
	Adjust the Rate Threshold Deadband Adjustment Pot fully CCW	Pitch	050 A7 R3		-		-
		Roll	050 A7 R4		-		-
		Yaw	050 A22 R3		-		-
		Pitch	050 A7 R2	050	A2	TP7	0 vdc
		Roll	050 A7 R5	050	A12	TP7	0 vdc
		Yaw	050 A22 R2	050	A17	TP7	0 vdc
	Apply a Rate Threshold Inject voltage equal to 1.20°/S	Pitch	-	T.C.	#24		+6.0 vdc
		Roll	-	T.C.	#25		+6.0 vdc
		Yaw	-	T.C.	#26		+6.0 vdc
	Readjust the Rate Threshold (Deadband) Adjustment Pot to turn on Amplifier	Pitch	050 A7 R3	050	A2	TP7	-10 vdc
		Roll	050 A7 R4	050	A12	TP7	-10 vdc
		Yaw	050 A22 R3	050	A17	TP7	-10 vdc
	Apply a Rate Threshold Inject voltage equal to 1.20°/S	Pitch	-	T.C.	#24		-6.0 vdc
		Roll	-	T.C.	#25		-6.0 vdc
		Yaw	-	T.C.	#26		-6.0 vdc
	Readjust the Rate Threshold Deadband Adjustment Pot to turn on Amplifier	Pitch	050 A7 R2	050	A2	TP7	+10 vdc
		Roll	050 A7 R5	050	A12	TP7	+10 vdc
		Yaw	050 A22 R2	050	A17	TP7	+10 vdc
12	Monitor - Rate Threshold Assist Circuit Adjustment Procedure						
	Adjust the Monitor Rate Threshold Assist Pots fully CCW	Pitch	070 A15 R1		-		-
		Roll	070 A15 R6		-		-
		Yaw	070 A14 R1		-		-

Table 11-4. Avionics Adjustments Data Sheet (Continued)

ITEM	ACTION	CHANNEL (AXIS)	ADJUSTMENT POT	TEST POINT BOX	TEST POINT P.C. CARD	TEST POINT T.P.	VOLTAGE
13	Monitor - Rate Threshold Circuit Adjustment Procedure						
	Place Hand Controller in center neutral position	Pitch	-	070	A2	TP7	0 vac
		Roll	-	070	A6	TP7	0 vac
		Yaw	-	070	A9	TP7	0 vac
	Adjust Rate Gyro signal to zero	Pitch	-	070	A2	TP6	0 vac
		Roll	-	070	A6	TP6	0 vac
		Yaw	-	070	A9	TP6	0 vac
	Adjust the Attitude Gyro to Zero	Pitch	-	050	A4	TP7	0 vac
		Roll	-	050	A10	TP7	0 vac
		Yaw	-	050	A10	TP6	0 vac
	Adjust the Rate Threshold Deadband Adjustment Pot fully CCW	Pitch	070 A15 R3		-		-
		Roll	070 A15 R4		-		-
		Yaw	070 A14 R3		-		-
		Pitch	070 A15 R2	070	A1	TP7	0 vdc
		Roll	070 A15 R5	070	A7	TP7	0 vdc
		Yaw	070 A14 R2	070	A10	TP7	0 vdc
	Apply a Rate Threshold Inject voltage equal to 1.27°/S	Pitch	-	T.C.	#33		+6.35 vdc
		Roll	-	T.C.	#34		+6.35 vdc
		Yaw	-	T.C.	#35		+6.35 vdc
	Readjust the Rate Threshold Deadband Adjustment Pot to turn on amplifier	Pitch	070 A15 R3	070	A1	TP7	-10 vdc
		Roll	070 A15 R4	070	A7	TP7	-10 vdc
		Yaw	070 A14 R3	070	A10	TP7	-10 vdc
	Apply a Rate Threshold Inject voltage equal to 1.27°/S.	Pitch	-	T.C.	#33		-6.35 vdc
		Roll	-	T.C.	#34		-6.35 vdc
		Yaw	-	T.C.	#35		-6.35 vdc
	Readjust the Rate Threshold Deadband adjustment pot to turn on amplifier	Pitch	070 A15 R2	070	A1	TP7	+10 vdc

Table 11-4. Avionics Adjustments Data Sheet (Continued)

ITEM	ACTION	CHANNEL (AXIS)	ADJUSTMENT POT	TEST POINT BOX	TEST POINT P.C. CARD	TEST POINT T.P.	VOLTAGE
		Roll	070 A15 R6	070	A7	TP7	+10 vdc
		Yaw	070 A14 R2	070	A10	TP7	+10 vdc
14	Primary - Attitude Threshold Circuit Adjustment Procedure						
	Place Hand Controller in center neutral position	Pitch					
		Roll					
		Yaw					
	Adjust Rate Gyro Signal to Zero	Pitch					
		Roll					
		Yaw					
	Adjust Attitude Gyro signal to Zero	Pitch					
		Roll					
		Yaw					
	Place Rate/Direct Switch in Direct Position	Pitch					
		Roll					
		Yaw					
	Adjust the Attitude Threshold (Deadband) Adjustments Pot fully CW	Pitch	050 A4 R2				
		Roll	050 A10 R2				
		Yaw	050 A19 R2				
	Place Rate/Direct Switch in Rate Position	Pitch	-				
		Roll	-				
		Yaw	-				
	Apply an Attitude signal at the Attitude Inject Test Point	Pitch	-	T.C.	#16		+248 mvdc
		Roll	-	T.C.	#17		+248 mvdc
		Yaw	-	T.C.	#18		+248 mvdc
	Adjust the Attitude Threshold (Deadband) Adjustment Pot to						

ITEM	ACTION	CHANNEL (AXIS)	ADJUSTMENT POT	TEST POINT			VOLTAGE
				BOX	P.C. CARD	T.P.	
	turn on amplifier	Pitch	050 A4 R2	050	A2	TP7	-10 vdc
		Roll	050 A10 R2	050	A12	TP7	-10 vdc
15	Adjust Rate Gyro signal for an Attitude Error Signal of 1.0°	Yaw	-	050	A21	TP7	+5.0 vdc
	Readjust the Rate Gyro signal to zero	Yaw	-				
	Adjust the Attitude Threshold (deadband) Adjustment Pot to turn on amplifier	Yaw	050 A19 R2	050	A17	TP7	+10 vdc
16	Primary - Model Circuit Adjustment Procedure						
	Place Rate/Direct Switch in Rate Mode Position	Pitch					
		Roll					
		Yaw					
	Place Model/No Model Switch in Model Mode Position	Pitch					
		Roll					
		Yaw					
	Adjust the Model Adjustment Pot to fully CW	Pitch	050 A3 R3		-		-
		Roll	050 A11 R3		-		-
		Yaw	050 A18 R3		-		-
	Apply a Step Voltage at the Rate Command Inject Point	Pitch	-	T.C.	#1		+10 vdc
		Roll	-	T.C.	#2		+10 vdc
		Yaw	-	T.C.	#3		+10 vdc
	Readjust the Model Adjustment Pot for desired slope	Pitch	050 A3 R3	050	A6	TP1	4.0 v/s($8°/s^2$)
		Roll	050 A11 R3	050	A8	TP1	4.0 v/s($8°/s^2$)
		Yaw	050 A18 R3	050	A21	TP1	4.0 v/s($8°/s^2$)
17	Monitor - Model Circuit Adjustment Procedure						
	Place Rate/Direct Switch in rate mode position	Pitch					

Table 11-4. Avionics Adjustments Data Sheet (Continued)

ITEM	ACTION	CHANNEL (AXIS)	ADJUSTMENT POT	TEST POINT BOX	T.P. CARD	T.P.	VOLTAGE
		Roll					
		Yaw					
	Place Model/No Model Switch						
	in Model Mode Position	Pitch					
		Roll					
		Yaw					
	Adjust the Model Adjustment						
	Pot to fully CW	Pitch	070 A3 R3		-		-
		Roll	070 A5 R3		-		-
		Yaw	070 A11 R3		-		-
	Apply a Step Voltage at the						
	Rate Command Inject Point	Pitch	-	T.C.	#30		+10 vdc
		Roll	-	T.C.	#31		+10 vdc
		Yaw	-	T.C.	#32		+10 vdc
	Readjust the Model Adjustment						
	Pot for desired slope	Pitch	070 A3 R3	070	A25	TP1	4.0 v/s($8°/s^2$)
		Roll	070 A5 R3	070	A25	TP4	4.0 v/s($8°/s^2$)
		Yaw	070 A11 R3	070	A12	TP1	4.0 v/s($8°/s^2$)
18	Primary - Model Lead Circuit						
	Adjustment Procedure						
	Set the Model Lead Term Adjust-						
	ment Pot to fully CCW	Pitch	050 A3 R1		-		-
		Roll	050 A11 R1		-		-
		Yaw	050 A18 R1		-		-
	Adjust the Model Lead Null Pot						
	to zero the Model Lead Output	Pitch	050 A3 R2	050	A3	TP2	0 vdc
		Roll	050 A11 R2	050	A11	TP2	0 vdc
		Yaw	050 A18 R2	050	A18	TP2	0 vdc
19	Monitor - Model Lead Circuit Ad-						
	justment Procedure						
	Set the Model Lead Term Adjust-						
	ment Pot to fully CCW	Pitch	070 A3 R1				
		Roll	070 A5 R1				
		Yaw	070 A11 R1				

Table 11-4. Avionics Adjustments Data Sheet (Continued)

ITEM	ACTION	CHANNEL (AXIS)	ADJUSTMENT POT	TEST POINT			VOLTAGE
				BOX	P.C. CARD	T.P.	
	Adjust the Model Lead Null Pot to zero the Model Lead Output	Pitch	070 A3 R2	070	A3	TP2	0 vdc
		Roll	070 A5 R2	070	A5	TP2	0 vdc
		Yaw	070 A11 R2	070	A11	TP2	0 vdc
20	Rate Switching Circuit Adjustment Procedure						
	Place the Hand Controller in the neutral (In Detent) Position	Pitch					
		Roll					
		Yaw					
	Adjust the Rate Gyro Signal for 1.0°/S Rate	Pitch	-				
		Roll	-				
		Yaw	-				
	Adjust the Rate Switching Adjustment Pot CW	Pitch	070 A21 R1	070	A21	TP1	1.3 vrms
		Roll	070 A23 R1	070	A23	RP1	1.3 vrms
		Yaw	050 A24 R1	050	A24	TP1	1.3 vrms
	Check Rate Switching circuit output voltage	Pitch	-	070	A21	TP4	0 vdc
		Roll	-	070	A23	TP3	0 vdc
		Yaw	-	050	A24	TP4	0 vdc
	Readjust the Rate Switching Adjustment Pot CCW for voltage	Pitch	070 A21 R1	070	A21	TP1	5.3 vrms
		Roll	070 A23 R1	070	A23	TP1	5.3 vrms
		Yaw	050 A24 R1	050	A24	TP1	5.3 vrms
	Check Rate Switching circuit output voltage	Pitch	-	070	A21	TP4	+28 vdc
		Roll	-	070	A23	TP4	+28 vdc
		Yaw	-	050	A24	TP4	+28 vdc
21	Monitor - Rate Gyro Excess Rate Switching Circuit Adjustment Procedure						

Table 11-4. Avionics Adjustments Data Sheet (Continued)

ITEM	ACTION	CHANNEL (AXIS)	ADJUSTMENT POT	TEST POINT			VOLTAGE
				BOX	P.C. CARD	T.P.	
	Adjust the Rate Gyro signal	Pitch	-				
	for 22.0°S Rate	Roll	-				
		Yaw	-				
	Adjust the Excess Rate Switching	Pitch	070 A19 R1	070	A20	TP7	+6.7 vdc
	Adjustment Pot CW for voltage	Roll	070 A19 R2	070	A22	TP7	+6.7 vdc
		Yaw	070 A19 R3	070	A13	TP7	+6.7 vdc
	Check the Excess Rate Switching	Pitch	-	070	A19	TP2	+28 vdc
	output	Roll	-	070	A19	TP5	+28 vdc
		Yaw	-	070	A19	TP8	+28 vdc
	Adjust the Excess Rate Switching	Pitch	070 A19 R1	070	A19	TP2	+7.0 vdc
	Adjustment Pot CCW	Roll	070 A19 R2	070	A19	TP5	+7.0 vdc
		Yaw	070 A19 R3	070	A19	TP8	+7.0 vdc
22	Monitor - Hand Controller Malf. Detection Circuit Adjustment Procedure						
	Adjust the Hand Controller Malf.	Pitch	070 A27 R1		-		
	Detection Circuit Pot fully CCW	Roll	070 A29 R1		-		
		Yaw	070 A31 R1		-		
		Pitch	070 A27 R2		-		
		Roll	070 A29 R2		-		
		Yaw	070 A31 R2		-		
	Adjust the Hand Controller	Pitch	-	070	A1	TP2	+1.66 vdc
	(Stick) for a 3.32°/S Rate	Roll	-	070	A7	TP2	+1.66 vdc
	Command	Yaw	-	070	A10	TP2	+1.66 vdc
	Check Hand Controller Mal-	Pitch	-	070	A26	TP1	0 vdc
	function Detection Circuit	Roll	-	070	A28	TP1	0 vdc
	Amplifier output	Yaw	-	070	A30	TP1	0 vdc
	Readjust the Hand Controller Mal-	Pitch	070 A27 R2	070	A26	TP1	-10 vdc
	function Detection Circuit Pot	Roll	070 A29 R2	070	A28	TP1	-10 vdc
	to turn on amplifier	Yaw	070 A31 R2	070	A30	TP1	-10 vdc
	Adjust the Hand Controller	Pitch	-	070	A1	TP2	-1.66 vdc
	(Stick) for a 3.32°/S Rate	Roll	-	070	A7	TP2	-1.66 vdc
	Command	Yaw	-	070	A10	TP2	-1.66 vdc

Table 11-4. Avionics Adjustments Data Sheet (Continued)

ITEM	ACTION	CHANNEL (AXIS)	ADJUSTMENT POT	TEST POINT			VOLTAGE
				BOX	P.C. CARD	T.P.	
	Check Hand Controller Malfunction Detection Circuit Amplifier output	Pitch	-	070	A26	TP1	0 vdc
		Roll	-	070	A28	TP1	0 vdc
		Yaw	-	070	A30	TP1	0 vdc
	Readjust the Hand Controller Malfunction Detection Circuit Pot to turn on amplifier	Pitch	070 A27 R1	070	A26	TP1	+10 vdc
		Roll	070 A29 R1	070	A28	TP1	+10 vdc
		Yaw	070 A31 R1	070	A30	TP1	+10 vdc
23	Monitor - Fuel Level Detector Adjustment Procedure						
	Set the Rocket Select Switch at the Both position	-					
	Set the Safety Switch at the On position	-					
	Adjust the Fuel Level Detector Scaling Pots to 5 turns	-	070 A24 R2, R3,R4,R5				
	Adjust the Lift Rocket Transducer Scaling Pot fully CW	-	070 A24 R6				
	Place the Set/Reset Switch at the Off position	-	-				
	Adjust the Lift Rocket Transducer Signal to 600 psia	-	-	Transducer			+15 vdc
	Adjust the Lift Rocket Transducer Scaling Pot for 57 mv/lb/sec Scale Factor	-	070 A24 R6	070	A24	TP9	+4.08 vdc
	Readjust the Lift Rocket Transducer Signal to 14.7 psia	-	-	Transducer			+368 mv
	Select the proper resistors for the Bias Offset Network	-	-	070	A12	TP4	minimum drift
	Adjust the Integrator Bias Pot for minimum drift	-	070 A12 R2	070	A12	TP4	minimum drift

Table 11-4. Avionics Adjustments Data Sheet (Continued)

ITEM	ACTION	CHANNEL (AXIS)	ADJUSTMENT POT	TEST POINT			VOLTAGE
				BOX	P.C. CARD	T.P.	
24	Backup - Rate Command Null Adjustment						
	Place the Hand Controller in the center neutral position	Pitch	-	030	A10	TP8	0 vac (null)
		Roll	-	030	A12	TP8	0 vac (null)
		Yaw	-	030	A6	TP8	0 vac (null)
	Adjust the Rate Command Null Pot for null at specified test point	Pitch	030 A10 R1	030	A11	TP2	0 vdc
		Roll	030 A12 R1	030	A13	TP2	0 vdc
		Yaw	030 A6 R1	030	A7	TP2	0 vdc
25	Backup - Rate Gyro Null Adjustment						
	Adjust the Rate Feedback Scaling Pot fully CW	Pitch	030 A10 R3		-		-
		Roll	030 A12 R3		-		-
		Yaw	030 A6 R3		-		-
	Adjust the Rate Feedback Null Pot for null	Pitch	030 A10 R2	030	A11	TP6	0 vdc
		Roll	030 A12 R2	030	A13	TP6	0 vdc
		Yaw	030 A6 R2	030	A7	TP6	0 vdc
26	Backup Rate Command Scale Factor Adjustment						
	Adjust the Hand Controller (Stick) Command to 20°S max. rate.	Pitch					2.8 vrm
		Roll					2.8 vrm
		Yaw					2.8 vrm
	Adjust the Rate Command Scaling Pot to fully CCW	Pitch	030 A10 R3		-		-
		Roll	030 A12 R3		-		-
		Yaw	030 A6 R3		-		-

Table 11-4. Avionics Adjustments Data Sheet (Continued)

ITEM	ACTION	CHANNEL	ADJUSTMENT POT	TEST POINT			VOLTAGE
				BOX	P.C. CARD	T.P.	
	Readjust the Rate Command Scaling						
	Pot for 500 mv/°/S Scale Factor	Pitch	030 A10 R3	030	A11	TP2	+10.0 vdc
		Roll	030 A12 R3	030	A13	TP2	+10.0 vdc
		Yaw	030 A6 R3	030	A7	TP2	+10.0 vdc
27	Backup Rate Gyro Circuit Scale						
	Factor Adjustment						
	Adjust the Backup Rate Gyro						
	Signal for 20°/S Rate Feedback	Pitch					3.0 vrms
		Roll					3.0 vrms
		Yaw					3.0 vrms
	Adjust the Rate Feedback						
	Scaling Pot to fully CCW	Pitch	030 A10 R4		-		-
		Roll	030 A12 R4		-		-
		Yaw	030 A6 R4		-		-
	Readjust the Rate Feedback						
	Scaling Pot for 500 mv/°/S						
	Scale Factor	Pitch	030 A10 R4	030	A11	TP6	+10.0 vdc
		Roll	030 A12 R4	030	A13	TP6	+10.0 vdc
		Yaw	030 A6 R4	030	A7	TP6	+10.0 vdc
28	Backup - Rate Threshold Circuit						
	Adjustment Procedure						
	Place Hand Controller in						
	center neutral position	Pitch					
		Roll					
		Yaw					
	Adjust the Backup Rate Gyro						
	Signal to zero	Pitch					
		Roll					
		Yaw					
	Adjust the Rate Threshold						
	(Deadband) Adjustment Pot						
	fully CCW	Pitch	030 A8 R2				
		Roll	030 A8 R5				
		Yaw	030 A5 R2				

Table 11-4. Avionics Adjustments Data Sheet (Continued)

ITEM	ACTION	CHANNEL	ADJUSTMENT POT	TEST POINT			VOLTAGE
				BOX	P.C. CARD	T.P.	
		Pitch	030 A8 R3				
		Roll	030 A8 R4				
		Yaw	030 A5 R3				
	Apply a Backup Rate Command						
	Inject voltage equal to 1.20°/S	Pitch	-	T.C.	No.	81	+10 vdc
		Roll	-	T.C.	No.	82	+10 vdc
		Yaw	-	T.C.	No.	83	+10 vdc
	Readjust the Rate Threshold						
	Adjustment Pot to turn on						
	amplifier	Pitch	030 A8 R2	030	A11	TP7	+10 vdc
		Roll	030 A8 R5	030	A13	TP7	+10 vdc
		Yaw	030 A5 R2	030	A7	TP7	+10 vdc
	Apply a Backup Rate Command						
	Inject voltage equal to 1.20°/S	Pitch	-	T.C.	No.	81	-10 vdc
		Roll	-	T.C.	No.	82	-10 vdc
		Yaw	-	T.C.	No.	83	-10 vdc
	Readjust the Rate Threshold						
	Adjustment Pot to turn on						
	amplifier	Pitch	030 A8 R3	030	A11	TP7	-10 vdc
		Roll	030 A8 R3	030	A13	TP7	-10 vdc
		Yaw	030 A5 R3	030	A7	TP7	-10 vdc
29	Backup - Rate Gyro Excess Rate						
	Switching Circuit Adjustment						
	Adjust the Backup Rate Gyro						
	signal for a 22.0 °/S rate	Pitch					
		Roll					
		Yaw					
	Adjust the Excess Rate Switching						
	Adjustment Pot CW for voltage	Pitch	030 A14 R1	030	A15	TP1	+6.7 vdc
		Roll	030 A14 R2	030	A15	TP2	+6.7 vdc
		Yaw	030 A14 R3	030	A15	TP6	+6.7 vdc
	Check the Backup Excess Rate						
	Switching output	Pitch	-	030	A14	TP2	+28 vdc
		Roll	-	030	A14	TP5	+28 vdc
		Yaw	-	030	A14	TP8	+28 vdc

ITEM	ACTION	CHANNEL	ADJUSTMENT POT	TEST POINT			VOLTAGE
				BOX	P.C. CARD	T.P.	
	Adjust the Excess Rate Switching						
	Adjustment Pot CCW	Pitch	030 A14 R1	030	A14	TP2	+7.0 vdc
		Roll	030 A14 R2	030	A14	TP5	+7.0 vdc
		Yaw	030 A14 R3	030	A14	TP8	+7.0 vdc

11-176. RATE GYRO REPLACEMENT ADJUSTMENTS

The following adjustments are required whenever the Rate gyros are changed:

11-177. RATE GYRO INITIAL POTENTIOMETER SETTINGS

A. Adjust the rate gyro potentiometers for a scale factor of 500 mv/°/sec in the primary, monitor, and backup electronics circuits.

B. Adjust the rate gyro null potentiometers to compensate for the rate gyro nulls in the primary, monitor, and backup electronics circuits.

C. Adjust the excess rate switching circuit to operate at an excess rate of 25 ± 1 °/sec in the primary and the backup electronics circuits.

D. Adjust the attitude synchronization switching circuit to switch for a rate gyro signal of 3.0 °/sec.

11-178. RATE GYRO TESTS REQUIRED

The following tests are required after the rate gyro initial potentiometer settings have been performed:

11-179. YAW RATE GYRO NON-REPEATABILITY

NOTE

The purpose of this measurement is to measure the hysteresis of the yaw gyro.

A. Mount rate gyro package on rate table in yaw configuration such that a clockwise rotation of the rate table corresponds to a yaw left rate.

B. Adjust rate table for yaw right rate. Increase slowly and continuously from 0°/sec to 25°/sec, and then decrease rate slowly and continuously to 0°/sec. Record the rate gyro DC null at TP9.

NOTE

The rate gyro DC null shall not exceed 0.085 vdc (0.17°/sec.)

C. Adjust rate table for yaw left rate. Increase slowly and continuously from 0°/sec to 25°/sec, and then decrease rate slowly and continuously to 0°/sec. Record the rate gyro DC null at TP9.

NOTE

The rate gyro DC null shall not exceed 0.085 vdc (0.17°/sec.)

D. Reset from rate backup if system has switched into rate backup.

11-180 RATE GYRO CIRCUITS YAW CALIBRATION

A. Place the Yaw Attitude Control Mode switch in the RATE position.

B. Place the Moment Compensation switch in the OFF position.

C. Mount the rate gyro triad on the rate table such that a clockwise rotation of the table corresponds to a yaw left rate.

D. Adjust the rate table for a 20.0°/sec yaw left rate.

E. Perform the measurements and record data according to the requirements of table 11-5.

YAW LEFT RATE GYRO TEST REQUIREMENTS

Measurement	Output Name	Test Point	Output Volt Requirements	Actual
Primary Rate Gyro	PRI	TP9	-10.0 ± 0.75 vdc	_____ vdc
Backup Rate Gyro	BU	TP89	-10.0 ± 0.75 vdc	_____ vdc
Monitor Rate Gyro	MON	MON A9 TP1	-10.0 ± 0.75 vdc	_____ vdc

F. Voltages shall be within limits specified in table 11-5.

G. Rocket indicators E_T, F_S, G_T, and H_S shall be illuminated.

H. The AUTO PILOT BACKUP indicator shall be extinguished.

NOTE

If the AUTO PILOT BACKUP indicator is ON, momentarily hold the AFCS switch in the PRIMARY RESET position and then release.

I. Adjust the rate table for 20.0°/sec yaw right rate.

J. Perform the measurements and record data according to the requirements of table 11-6.

TABLE 11-6

YAW RIGHT RATE GYRO TEST REQUIREMENTS

Measurement	Output Name	Test Point	Output Volt Requirements	Actual
Primary Rate Gyro	PRI	TP9	+10.0 ± 0.75 vdc	_____ vdc
Backup Rate Gyro	BU	TP89	+10.0 ± 0.75 vdc	_____ vdc
Monitor Rate Gyro	MON	MON A9 TP1	+10.0 ± 0.75 vdc	_____ vdc

K. Voltages shall be within limits specified in table 11-6.

L. Rocket indicators E_S, F_T, G_S, and H_T shall be illuminated.

M. The AUTO PILOT BACKUP indicator shall be extinguished.

NOTE

If the AUTO PILOT BACKUP indicator is ON, momentarily hold the AFC switch in the PRIMARY RESET position and then release.

N. Adjust the rate table to zero.

11-181. RATE GYRO YAW ATTITUDE HOLD SYNC. CIRCUIT

A. Place the Yaw Attitude Control Mode switch in the RATE position.

B. Place the Moment Compensation switch in the OFF position.

C. Connect the test cart TP23 and TP41 to the recorder. Connect TP100 and TP101 to the recorder.

D. Place the rate gyro package on the rate table and adjust for a yaw right rate and set for +0.050 ± 0.010 vdc at TP9 corresponding to a 0.1°/sec rate.

E. Move and hold the ACA out of yaw detent until the voltage at the test cart TP23 is less than 100 mvdc and then return stick to zero.

F. Wait until the voltage at TP23 integrates to -10.0 ± 2.5 vdc.

G. The steady state voltage at TP23 shall be -10.0 ± 2.5 vdc.

H. Rocket indicators E_T, F_S, G_T, and H_S shall illuminate when voltage at TP23 is -7.0 ± 1.25 vdc.

I. Slowly increase the rate table to simulate an increasing yaw right rate.

J. The voltage at TP41 shall change from a nominal zero volts to $28.0\ ^{+0.5}_{-3.5}$ at a yaw rate of $3.0^{\circ} \pm 0.3^{\circ}$/sec on the rate table.

K. The voltage at TP23 shall decrease to 100 mvdc within 3.0 sec. after test cart TP41 goes to +28.0 vdc.

L. Adjust the rate table to zero rate.

11-182 RATE GYRO DIRECT WITH MODEL, PRIMARY AND BACKUP RATE GYROS

NOTE

The primary rate gyro and the backup rate gyro connectors shall be mated with the rate gyro triad package.

A. Place the Moment Compensation switch to the ON position.

B. Adjust the rate table for a yaw right rate until the BACKUP RATE BYRO MALFUNCTION and the AUTO PILOT BACKUP indicators illuminate.

C. The BACKUP RATE GYRO MALFUNCTION and the AUTO PILOT BACKUP indicators shall illuminate at a rate of $25 \pm 1^{\circ}$/sec.

D. The voltage at TP125 shall be $28\ ^{+0.5}_{-3.5}$ vdc.

E. Adjust the rate table for 0°/sec.

F. The BACKUP RATE GYRO MALFUNCTION indicator shall extinguish.

G. The AUTO PILOT BACKUP indicator shall remain illuminated.

H. Hold the AFCS Primary Reset switch in the PRIMARY RESET position and then release.

I. The AUTO PILOT BACKUP indicator shall extinguish.

J. Adjust the rate table for a yaw left rate and increase until the BACKUP RATE GYRO MALFUNCTION and the AUTO PILOT BACKUP indicators illuminate.

K. The BACKUP RATE GYRO MALFUNCTION and the AUTO PILOT BACKUP indicators shall illuminate at a rate of 25 ± 1°/sec.

L. The voltage at TP126 shall be $28\ ^{+0.5}_{-3.5}$ vdc.

M. Adjust the rate table for 0°/sec.

N. The BACKUP RATE GYRO MALFUNCTION indicator shall extinguish.

O. The AUTO PILOT BACK UP indicator shall remain illuminated.

P. Hold the AFCS Primary Reset switch in the PRIMARY RESET position and release.

Q. The AUTO PILOT BACKUP indicator shall extinguish.

R. Place the Moment Compensation switch in the OFF position.

11-183. RATE GYRO TORQUING CURRENT SENSITIVITY - YAW CHANNEL, PRIMARY

A. Place the Yaw Attitude Control Mode switch in the RATE position.

B. Place the Moment Compensation switch in the ON position.

C. Rotate the ACA 3.0° yaw right.

D. Rocket indicators E_T, F_S, G_T, and H_S shall illuminate.

E. Record the voltage at TP6 (stick command output V_{TP6}).

NOTE

The voltage reading at TP6 shall be used in a calculation that will follow.

F. Apply a positive DC torquing current at the test cart TP168 (yaw primary torquer), increasing the torquing current until rocket indicators E_T, F_S, G_T, and H_S extinguish.

G. Measure the torquing current into TP168 (Reading No. 1) and record.

H. Increase the torquing current at TP168 until rocket indicators E_S, F_T, G_S, and H_T illuminate.

I. Measure the torquing current into TP168 (Reading No. 2) and record.

J. Calculate the average torquing current where I_1 = Reading No. 1 and I_2 = Reading No. 2.

K. The average torquing current shall be $\frac{I_1 + I_2}{2}$.

L. Calculate the value of 28 V_{TP6} from Step No. E, where $\frac{I_1 + I_2}{2} = 28\ V_{TP6}$.

M. The average torquing current shall be equal to 28 $V_{TP6} \pm 20\%$.

N. Remove the torquing current from TP168.

O. Return the ACA to zero position (yaw detent).

P. Rotate the ACA 3.0° yaw left.

Q. Rocket indicators E_S, F_T, G_S, and H_T shall illuminate

R. Record the voltage at TP6 (stick command output V_{TP6}).

NOTE

The voltage reading at TP6 shall be used in a calculation that will follow.

S. Apply a negative DC torquing current at the test cart TP168 (yaw primary torquer), increasing the torquing current until rocket indicators E_S, F_T, G_S, and H_T shall extinguish.

T. Measure the torquing current into TP168 (Reading No. 3) and record.

U. Increase the torquing current at TP168 until rocket indicators E_T, F_S, G_T, and H_T illuminate.

V. Measure the torquing current into TP168 (Reading No. 4) and record.

W. Calculate the average torquing current where I_3 = Reading No. 3 and I_4 = Reading No. 4.

X. The average torquing current shall be $\frac{I_3 + I_4}{2}$.

Y. Calculate the value of 28 V_{TP6} from Step R, where $\frac{I_3 + I_4}{2} = 28\ V_{TP6}$.

Z. The average torquing current shall be equal to 28 V_{TP6} ± 20%.

AA. Remove the torquing current from TP168.

AB. Return the ACA to zero position (yaw detent).

AC. Place the Moment Compensation switch in the OFF position.

11-184. RATE GYRO TORQUING CURRENT SENSITIVITY - YAW CHANNEL BACKUP

A. Place Primary/Backup switch in BACKUP position.

B. Place Pitch, Roll and Yaw Mode switches to DIRECT.

C. Place the Moment Compensation switch in the OFF position.

D. Rotate the ACA 3.0° yaw right.

E. Rocket indicators E_T, F_S, G_T, and H_S shall illuminate.

F. Record the voltage at TP86 (stick command output V_{TP86}).

NOTE

The voltage reading at TP86 shall be used in a calculation that will follow.

G. Apply a positive DC torquing current at the test cart TP172 (yaw backup torquer), increasing the torquing current until rocket indicators E_T, F_S, G_T, and H_S extinguish.

H. Measure the torquing current into TP172 (Reading No. 1) and record.

I. Increase the torquing current at TP172 until rocket indicators E_S, G_T, G_S, and H_T illuminate.

J. Measure the torquing current into TP172 (Reading No. 2) and record.

K. Calculate the average torquing current current where I_1 = Reading No. 1 and I_2 = Reading No. 2.

L. The average torquing current shall be $\frac{I_1 + I_2}{2}$.

M. Calculate the value of 28 V_{TP86} from Step No. F, where $\frac{I_1 + I_2}{2} = 28\ V_{TP86}$.

N. The average torquing current shall be equal to 28 V_{TP86} ± 20%.

O. Remove the torquing current from TP172.

P. Return the ACA to zero position (yaw detent).

Q. Rotate the ACA 3.0° yaw left.

R. Rocket indicators E_S, F_T, G_S, and H_T shall illuminate.

S. Record the voltage at TP86 (stick command output V_{TP86}).

NOTE

The voltage reading at TP86 shall be used in a calculation that will follow.

T. Apply a negative DC torquing current at the test cart TP172 (yaw backup torquer), increasing the torquing current until rocket indicators E_S, F_T, G_S, and H_T extinguish.

U. Measure the torquing current into TP172 (Reading No. 3) and record.

V. Increase the torquing current at TP172 until rocket indicators E_T, F_S, G_T, and H_S illuminate.

W. Measure the torquing current into TP172 (Reading No. 4) and record.

X. Calculate the average torquing current where I_3 = Reading No. 3 and I_4 = Reading No. 4.

Y. The average torquing current shall be $\frac{I_3 + I_4}{2}$.

Z. Calculate the value of 28 V_{TP86} from Step No. S, where $\frac{I_3 + I_4}{2} = 28\ V_{TP86}$.

AA. The average torquing current shall be equal to 28 V_{TP86} ± 20%.

AB. Remove the torquing current from TP172.

AC. Return the ACA to zero position (yaw detent).

AD. Return the Primary/Backup switch to the PRIMARY position. Actuate the Primary Reset switch to extinguish the AUTO PILOT BACK UP indicator.

11-185. PITCH RATE GYROS - CALIBRATION OF RATE GYRO CIRCUITS, PITCH

A. Place the Pitch Attitude Control Mode switch to the RATE position.

B. Place the Moment Compensation switch in the OFF position.

C. Mount the rate gyro triad on the rate table such that a clockwise rotation of the table corresponds to a pitch up rate.

D. Adjust the rate table for a 20.0°/sec pitch down rate

E. Perform the measurements and record data according to the requirements of table 11-7.

TABLE 11-7

PITCH DOWN RATE GYRO TEST REQUIREMENTS

Measurement	Output Name	Test Point	Output Volt Requirements	Actual
Primary Rate Gyro	PRI	TP7	-10.0 ± 0.75 vdc	_____ vdc
Backup Rate Gyro	BU	TP87n	-10.0 ± 0.75 vdc	_____ vdc
Monitor Rate Gyro	MON	MON A2 TP1	-10.0 ± 0.75 vdc	_____ vdc

F. Voltages shall be within the limits specified in table 11-7.

G. Rocket indicators A_T, B_S, C_S, and D_T shall be illuminated.

H. The AUTO PILOT BACK UP indicator shall be extinguished.

NOTE

If the AUTO PILOT BACK UP indicator is ON, momentarily hold the AFCS switch in the PRIMARY RESET position and then release.

I. Adjust the rate table for 20.0°/sec pitch up rate.

J. Perform the measurements and record data according to the requirements of table 11-8.

TABLE 11-8

PITCH UP RATE GYRO TEST REQUIREMENTS

Measurement	Output Name	Test Point	Output Volt Requirement	Actual
Primary Rate Gyro	PRI	TP7	+10.0 ± 0.75 vdc	_____ vdc
Backup Rate Gyro	BU	TP87	+10.0 ± 0.75 vdc	_____ vdc
Monitor Rate Gyro	MON	MON A2 TP1	+10.0 ± 0.75 vdc	_____ vdc

K. Voltages shall be within the limits specified in table 11-8.

L. Rocket indicators A_S, B_T, C_T, and D_S shall be illuminated.

M. The AUTO PILOT BACK UP indicator shall be extinguished.

NOTE

If the AUTO PILOT BACK UP indicator is ON, momentarily hold the AFCS switch in the PRIMARY RESET position and then release.

N. Adjust the rate table to zero.

11-186. ATTITUDE HOLD SYNC. CIRCUIT - PITCH CHANNEL

A. Place Pitch Attitude Control Mode switch in RATE position.

B. Place the Moment Compensation switch in the OFF position.

C. Place the attitude gyro package on the precision angle indicator and adjust for 0° pitch attitude.

D. Connect TP21 and TP39 to the recorder inputs on the test cart. Turn on the recorder.

E. Move and hold the ACA out of pitch detent until the voltage at TP21 is less than 100 mvdc, then return the ACA to zero.

F. Adjust the attitude gyro for a 2.0 ± 0.1° pitch up attitude.

G. The voltage at TP21 shall be +10.0 ± 2.5 vdc.

H. Place the rate gyro on the rate table such that a pitch up rate corresponds to a clockwise rotation of the table.

I. Start the rate table and slowly increase the rate to simulate a pitch up rate.

J. Voltage at TP39 shall change from a nominal 0 volts to a nominal +28 vdc at a pitch up rate of 3.0 ± 0.1°/sec.

K. Voltage at TP21 shall decrease to 100 mvdc in less than 3 seconds after voltage at TP39 changes to +28 vdc.

L. Adjust the rate table to 0°/sec. rate.

11-187. EXCESS RATE - DIRECT WITH MODEL, PRI AND B/U RATE GYROS

NOTE

The primary rate gyro and the backup gyro connectors shall be mated with the rate gyro triad package.

A. Place the Moment Compensation switch in the ON position.

B. Adjust the rate table for a pitch up rate until the BACKUP RATE GYRO MALFUNCTION and the AUTO PILOT BACK UP indicators illuminate.

C. The BACKUP RATE GYRO MALFUNCTION and the AUTO PILOT BACK UP indicators shall illuminate at a rate of 25 $\pm$ 1°/sec.

D. The voltage at TP122 shall be 28 $^{+\ 0.5}_{-\ 3.5}$ vdc.

E. Adjust the rate table for 0°/sec.

F. The BACKUP RATE GYRO MALFUNCTION indicator shall extinguish.

G. The AUTO PILOT BACK UP indicator shall remain illuminated.

H. Momentarily hold the AFCS Primary Reset switch in the PRIMARY RESET position and then release.

I. The AUTO PILOT BACK UP indicator shall extinguish.

J. Adjust the rate table for a pitch down rate until the BACKUP RATE GYRO MALFUNCTION and the AUTO PILOT BACK UP indicators illuminate.

K. The BACKUP RATE GYRO MALFUNCTION and the AUTO PILOT BACK UP indicators shall illuminate at a rate of 25 $\pm$ 1°/sec.

L. The voltage at TP113 shall be 28 $^{+\ 0.5}_{-\ 3.5}$ vdc.

M. Adjust the rate table for 0°/sec.

N. The BACKUP RATE GYRO MALFUNCTION indicator shall extinguish.

O. The AUTO PILOT BACK UP indicator shall remain illuminated.

P. Momentarily hold the AFCS Primary Reset switch in the PRIMARY RESET position and release.

Q. The AUTO PILOT BACK UP indicator shall extinguish.

R. Place the Moment Compensation switch in the OFF position.

11-188. RATE GYRO TORQUING CURRENT SENSITIVITY, PITCH CHANNEL,PRIMARY

A. Place the Pitch Attitude Control Mode switch in the RATE position.

B. Place the Moment Compensation switch in the ON position.

C. Rotate the ACA 3.0° pitch up.

D. Rocket indicators A_T, B_S, C_S, and D_T shall illuminate.

E. Record the voltate at TP4 (stick command output V_{TP4}).

NOTE

The voltage reading at TP4 shall be used in a calculation that will follow.

F. Apply a positive DC torquing current at the test cart TP166 (pitch primary torquer), increasing the torquing current until rocket indicators A_T, B_S, C_S, and D_T shall extinguish.

G. Measure the torquing current into TP166 (Reading No. 1) and record.

H. Increase the torquing current at TP166 until rocket indicators A_S, B_T, C_T, and D_S illuminate.

I. Measure the torquing current into TP166 (Reading No. 2) and record.

J. Calculate the average torquing current where I_1 = Reading No. 1 and I_2 = Reading No. 2.

K. The average torquing current shall be $\frac{I_1 + I_2}{2}$.

L. Calculate the value of 28 V_{TP4} from Step No. E, where $\frac{I_1 + I_2}{2} = 28\ V_{TP4}$.

M. The average torquing current shall be equal to 28 V_{TP4} ± 20%.

N. Remove the torquing current from TP166.

O. Return the ACA to zero position (pitch detent).

P. Rotate the ACA 3.0° pitch down.

Q. Rocket indicators A_S, B_T, C_T, and D_S shall illuminate.

R. Record the voltage at TP4 (stick command output V_{TP4}).

NOTE

The voltage reading at TP4 shall be used in a calculation that will follow.

S. Apply a negative DC torquing current at the test cart TP166 (pitch primary torquer), increasing the torquing current until rocket indicators A_S, B_T, C_T, and D_S shall extinguish.

T. Measure the torquing current into TP166 (Reading No. 3) and record.

U. Increase the torquing current at TP166 until rocket indicators A_T, B_S, C_S, and D_T illuminate.

V. Measure the torquing current into TP166 (Reading No. 4) and record.

W. Calculate the average torquing current, where I_3 = Reading No. 3 and I_4 = Reading No. 4.

X. The average torquing current shall be $\frac{I_3 + I_4}{2}$.

Y. Calculate the value of 28 V_{TP4} from Step No. R, where $\frac{I_3 + I_4}{2} = 28\ V_{TP6}$.

Z. The average torquing current shall be equal to $28V_{TP4}$ ± 20%.

AA. Remove the torquing current from TP166.

AB. Return the ACA to zero position (pitch detent).

AC. Place the Moment Compensation switch in the OFF position.

11-189. RATE GYRO TORQUING CURRENT SENSITIVITY - PITCH CHANNEL, BACKUP

A. Place the Primary/Backup switch in the BACKUP position.

B. Place the Pitch, Roll, and Yaw Mode switches to DIRECT.

C. Place the Moment Compensation switch in the OFF position.

D. Rotate the ACA 3.0° pitch up.

E. Rocket indicators A_T, B_S, C_S, and D_T shall illuminate.

F. Record the voltage at TP84 (stick command output V_{TP84}).

NOTE

The voltage reading at TP84 shall be used in a calculation that will follow.

G. Apply a positive DC torquing current at the test cart TP170 (pitch backup torquer), increasing the torquing current until rocket indicators A_T, B_S, C_S, and D_T extinguish.

H. Measure the torquing current into TP170 (Reading No. 1) and record.

I. Increase the torquing current at TP170 until rocket indicators A_S, B_T, C_T, and D_S illuminate.

J. Measure the torquing current into TP170 (Reading No. 2) and record.

K. Calculate the average torquing current where I_1 = Reading No. 1 and I_2 = Reading No. 2.

L. The average torquing current shall be $\frac{I_1 + I_2}{2}$.

M. Calculate the value of 28 V_{TP84} from Step No. F, where $\frac{I_1 + I_2}{2} = 28\ V_{TP84}$.

N. The average torquing current shall be equal to 28 V_{TP84} ± 20%.

O. Remove the torquing current from TP170.

P. Return the ACA to zero position (pitch detent).

Q. Rotate the ACA 3.0° pitch down.

R. Rocket indicators A_S, B_T, C_T and D_S shall illuminate

S. Record the voltage at TP84 (stick command output V_{TP84}).

NOTE

The voltage reading at TP84 shall be used in a calculation that will follow.

T. Apply a negative DC torquing current at the test cart TP170 (pitch backup torquer), increasing the torquing current until rocket indicators A_S, B_T, C_T, and D_S extinguish.

U. Measure the torquing current into TP170 (Reading No. 3) and record.

V. Increase the torquing current at TP170 until rocket indicators A_T, B_S, C_S, and D_T shall illuminate.

W. Measure the torquing current into TP170 (Reading No. 4) and record.

X. Calculate the average torquing current, where I_3 = Reading No. 3 and I_4 = Reading No. 4.

Y. The average torquing current shall be $\frac{I_3 + I_4}{2}$.

Z. Calculate the value of 28 V_{TP84} from Step No. S, where $\frac{I_3 + I_4}{2} = 28\ V_{TP84}$.

AA. The average torquing current shall be equal to $28V_{TP84} \pm 20\%$.

AB. Remove the torquing current from TP170.

AC. Return the ACA to zero position (pitch detent).

AD. Return the Primary/Backup switch to the PRIMARY position. Actuate the Primary Reset switch to extinguish the AUTO PILOT BACK UP indicator.

11-190 CALIBRATION OF RATE GYRO CIRCUITS, ROLL

A. Place the Roll Attitude Control Mode switch to RATE position.

B. Place the Moment Compensation switch in the OFF position.

C. Mount the rate gyro triad on the rate table such that a clockwise ratation of the table corresponds to a roll right rate.

D. Adjust the rate table for a 20.0°/sec. roll left rate.

E. Perform the measurements and record data according to the requirements of table 11-9.

TABLE 11-9

ROLL LEFT RATE GYRO TEST REQUIREMENTS

Measurement	Output Name	Test Point	Output Volt Requirement	Actual
Primary Rate Gyro	PRI	TP8	-10.0 ± 0.75 vdc	_____vdc
Backup Rate Gyro	BU	TP88	-10.0 ± 0.75 vdc	_____vdc
Monitor Rate Gyro	MON	MON A6 TP1	-10.0 ± 0.75 vdc	_____vdc

F. Voltages shall be within the limits specified in table 11-9.

G. Rocket indicators A_T, B_T, C_S, and D_S shall be illuminated.

H. The AUTO PILOT BACK UP indicator shall be extinguished.

NOTE

If the AUTO PILOT BACK UP indicator is On, momentarily hold the AFCS switch in the PRIMARY RESET position and then release.

I. Adjust the rate table for 20.0°/sec roll right rate.

J. Perform the measurements and record data according to the requirements of table 11-10.

TABLE 11-10

ROLL RIGHT RATE GYRO TEST REQUIREMENTS

Measurement	Output Name	Test Point	Output Volt Requirement	Actual
Primary Rate Gyro	PRI	TP8	+10.0 ± 0.75 vdc	_____vdc
Backup Rate Gyro	BU	TP88	+10.0 ± 0.75 vdc	_____vdc
Monitor Rate Gyro	MON	MON A6 TP1	+10.0 ± 0.75 vdc	_____vdc

K. Voltages shall be within the limits specified in table 11-10.

L. Rocket indicators A_S, B_S, C_T, and D_T shall be illuminated.

M. The AUTO PILOT BACK UP indicator shall be extinguished.

NOTE

If the AUTO PILOT BACK UP indicator is ON, momentarily hold the AFCS switch in the PRIMARY RESET position and then release.

N. Adjust the rate table to zero.

11-191. ATTITUDE HOLD SYNC. CIRCUIT

A. Place the Roll Attitude Control Mode switch in RATE position.

B. Place the Moment Compensation switch in the OFF position.

C. Place the attitude gyro package on the precision angle indicator and adjust for 0° roll attitude.

D. Connect TP22 and TP40 to the recorder inputs on the test cart. Turn on the recorder.

E. Move and hold the ACA out of roll detent until the voltage at TP22 is less than 100 mvdc, then return the ACA to zero.

F. Adjust the attitude gyro for a $2.0 \pm 0.1^{\circ}$ roll right attitude.

G. Voltage at TP22 shall be $+ 10.0 \pm 2.5$ vdc.

H. Place the rate gyro on the rate table such that a roll right rate corresponds to a clockwise rotation of the table.

I. Start the rate table and slowly increase the rate to simulate a roll right rate.

J. Voltage at TP40 shall change from a nominal 0 volts to a nominal +28 vdc at a roll right rate of $3.0 \pm 0.3^{\circ}$/sec.

K. After the voltage at TP40 changes to +28 vdc, voltage at TP22 shall decrease to 100 mvdc in less than 3 seconds.

L. Adjust the rate table to 0°/sec. rate.

11-192. EXCESS RATE - DIRECT WITH MODEL, PRIMARY AND BACKUP RATE GYROS.

NOTE

The primary rate gyro and the backup rate gyro connectors shall be mated with the rate gyro triad package.

(11-192) A. Place the Moment Compensation switch in the ON position.

B. Adjust the rate table for a roll right rate until the BACKUP RATE GYRO MALFUNCTION and the AUTO PILOT BACK UP indicators illuminate.

C. The BACKUP RATE GYRO MALFUNCTION and the AUTO PILOT BACK UP indicators shall illuminate at a rate of $25 \pm 1^{\circ}$/sec.

D. The voltage at TP112 shall be $28 \begin{smallmatrix} + 0.5 \\ - 3.5 \end{smallmatrix}$ vdc.

E. Adjust the rate table for 0°/sec.

F. The BACKUP RATE GYRO MALFUNCTION indicator shall extinguish.

G. The AUTO PILOT BACK UP indicator shall remain illuminated.

H. Hold the AFCS Primary Reset switch in the PRIMARY RESET position and then release.

I. The AUTO PILOT BACK UP indicator shall extinguish.

J. Adjust the rate table for a roll left rate until the BACKUP RATE GYRO MALFUNCTION and the AUTO PILOT BACK UP indicators illuminate.

K. The BACKUP RATE GYRO MALFUNCTION and the AUTO PILOT BACK UP indicators shall illuminate at a rate of $25 \pm 1^{\circ}$/sec.

L. The voltage at TP114 shall be $28 \begin{smallmatrix} + 0.5 \\ - 3.5 \end{smallmatrix}$ vdc.

M. Adjust the rate table for 0°/sec.

N. The BACKUP RATE GYRO MALFUNCTION indicator shall extinguish.

O. The AUTO PILOT BACK UP indicator shall remain illuminated.

P. Hold the AFCS Primary Reset switch in the PRIMARY RESET position and then release.

Q. The AUTO PILOT BACK UP indicator shall extinguish.

R. Place the Moment Compensation switch in the OFF position.

11-193 RATE GYRO TORQUING CURRENT SENSITIVITY, ROLL CHANNEL, PRIMARY

A. Place the Roll Attitude Control Mode switch in the RATE position.

B. Place the Moment Compensation switch in the ON position.

C. Rotate the ACA 3.0° roll right.

D. Rocket indicators A_T, B_T, C_S, and D_S shall illuminate.

E. Record the voltage at TP5 (stick command output V_{TP5}).

NOTE

The voltage reading at TP5 shall be used in a calculation that will follow.

F. Apply a positive DC torquing current at the test cart TP167 (roll primary torquer), increasing the torquing current until rocket indicators A_T, B_T, C_S, and D_S extinguish.

G. Measure the torquing current into TP167 (Reading No. 1) and record.

H. Increase the torquing current at TP167 until rocket indicators A_S, B_S, C_T, and D_T illuminate.

I. Measure the torquing current into TP167 (Reading No. 2) and record.

J. Calculate the average torquing current where I_1 = Reading No. 1 and I_2 = Reading No. 2.

K. The average torquing current shall be $\frac{I_1 + I_2}{2}$.

L. Calculate the value of 28 V_{TP5} from Step No. E, where $\frac{I_1 + I_2}{2} = 28\ V_{TP5}$.

M. The average torquing current shall be equal to 28 V_{TP5} ± 20%.

N. Remove the torquing current from TP167.

O. Return the ACA to zero position (roll detent).

P. Rotate the ACA 3.0° roll left.

Q. Rocket indicators A_S, B_S, C_T, and D_T shall illuminate.

R. Record the voltage at TP5 (stick command output V_{TP5}).

NOTE

The voltage reading at TP5 shall be used in a calculation that will follow.

S. Apply a negative DC torquing current at the test cart TP167 (roll primary torquer), increasing the torquing current until rocket indicators A_S, B_S, C_T, and D_T shall extinguish.

T. Measure the torquing current into TP167 (Reading No. 3) and record.

U. Increase the torquing current at TP167 until rocket indicators A_T, B_T, C_S, and D_S illuminate.

V. Measure the torquing current into TP167 (Reading No. 4) and record.

W. Calculate the average torquing current where I_3 = Reading No. 3 and I_4 = Reading No. 4.

X. The average torquing current shall be $\frac{I_3 + I_4}{2}$.

Y. Calculate the value of 28 V_{TP5} from Step No. R, where $\frac{I_3 + I_4}{2} = 28V_{TP5}$

Z. The average torquing current shall be equal to 28 V_{TP5} ± 20%.

AA. Remove the torquing current from TP167.

AB. Return the ACA to zero position (roll detent).

AC. Place the Moment Compensation switch in the OFF position.

11-194. RATE GYRO TORQUING CURRENT SENSITIVITY, ROLL CHANNEL, BACK UP

A. Place the Rate/Backup switch in the BACKUP position.

B. Place the Pitch, Roll, and Yaw Attitude Control Mode switches to DIRECT.

C. Place the Moment Compensation switch in the OFF position.

D. Place the Roll Attitude Control Mode switch in the RATE position.

E. Place the Moment Compensation switch in the ON position.

F. Rotate the ACA 3.0° roll right.

G. Rocket indicators A_T, B_T, C_S, and D_S shall illuminate.

H. Record the voltage at TP85 (stick command output V_{TP85}).

NOTE

The voltage reading at TP85 shall be used in a calculation that will follow

I. Apply a positive DC torquing current at the test cart TP171 (roll backup torquer), increasing the torquing current until rocket indicators A_T, B_T, C_S, and D_S extinguish.

J. Measure the torquing current into TP171 (Reading No. 1) and record.

K. Increase the torquing current at TP171 until rocket indicators A_S, B_S, C_T, and D_T illuminate.

L. Measure the torquing current into TP171 (Reading No. 2) and record.

M. Calculate the average torquing current where I_1 = Reading No. 1 and I_2 = Reading No. 2.

N. The average torquing current shall be $\frac{I_1 + I_2}{2}$.

O. Calculate the value of 28 V_{TP85} from Step No. H, where $\frac{I_1 + I_2}{2} = 28\ V_{TP85}$.

P. The average torquing current shall be equal to 28 $V_{TP85} \pm 20\%$.

Q. Remove the torquing current from TP171.

R. Return the ACA to zero position (roll detent).

S. Rotate the ACA 3.0° roll left.

T. Rocket indicators A_S, B_S, C_T, and D_T shall illuminate.

U. Record the voltage at TP85 (stick command output V_{TP85}).

NOTE

The voltage reading at TP85 shall be used in a calculation that will follow.

V. Apply a negative DC torquing current at the test cart TP171 (roll backup torquer), increasing the torquing current until rocket indicators A_S, B_S, C_T, and D_T extinguish.

W. Measure the torguing current into TP171 (Reading No. 3) and record.

X. Increase the torquing current at TP171 until rocket indicators A_T, B_T, C_S, and D_S illuminate.

Y. Measure the torquing current into TP171 (Reading No. 4) and record.

Z. Calculate the average torquing current where I_3 = Reading No. 3 and I_3 = Reading No. 4.

AA. The average torquing current shall be $\frac{I_3 + I_4}{2}$.

AB. Calculate the values of 28 V_{TP85} from Step No. U, where $\frac{I_3 + I_4}{2} = 28\ V_{TP85}$.

AC. The average torquing current shall be equal to 28 V_{TP85} ± 20%.

AD. Remove the torquing current from TP171.

AE. Return the ACA to zero position (roll detent).

AF. Return the Primary/Backup switch to the PRIMARY position.

11-195. VERTICAL GYRO WITH SYNCHROS ADJUSTMENTS

The following adjustments are required whenever the vertical gyro with synchros is changed.

A. With gyro package mounted on a horizontal plane ($0^\circ \pm 6$ min) adjust gyros for an AC null at PRI A4 TP7 (pitch) and PRI A10 TP7.

11-196. VERTICAL GYRO WITH SYNCHROS INITIAL POTENTIOMETER SETTINGS

A. The primary electronics attitude gyro gain potentiometer shall be adjusted for 200 mv/deg in pitch and roll.

B. The primary electronics attitude gyro null potentiometer shall be adjusted to compensate for the null in the gyro.

11-197. VERTICAL GYRO WITH SYNCHROS TESTS REQUIRED

The following tests are required after the vertical gyro with synchros initial potentiometer settings have been performed.

11-198. ATTITUDE THRESHOLD, PITCH CHANNEL

A. Place the Pitch Attitude Control Mode switch in the RATE position.

B. Place the Moment Compensation switch in OFF position.

C. Place the pitch attitude gyro package on the precision angle indicator and set table for 0° pitch attitude.

D. Move the ACA out of the pitch detent until the voltage at test point TP21 is less than 100 mvdc and then return to zero (pitch detent).

E. Slowly rotate the attitude gyro for a pitch down position of $1.0 \pm 0.3^{\circ}$.

F. Rocket indicators A_T, B_S, C_S, and D_T shall illuminate.

G. The attitude gyro shall be rotated for a pitch down position of $1.0 \pm 0.3^{\circ}$.

H. Slowly rotate the Attitude Gyro for a pitch up position of $1.0 \pm 0.3^{\circ}$.

I. Rocket indicators A_S, B_T, C_T, and D_S shall illuminate.

J. The attitude gyro shall be rotated for a pitch up position of $1.0 \pm 0.3^{\circ}$.

11-199. ATTITUDE THRESHOLD, ROLL CHANNEL

A. Place the Roll Attitude Control Mode switch in the RATE position.

B. Place the Moment Compensation switch in the OFF position.

C. Move the ACA out of the roll detent until the voltage at test point TP22 is less than 100 mvdc and then return to zero (roll detent).

D. Slowly rotate the attitude gyro roll left until rocket indicators A_T, B_T, C_S, and D_S illuminate.

E. The roll left attitude shall be $1.0 \pm 0.3^{\circ}$.

F. Slowly rotate the attitude gyro roll right until rocket indicators A_S, B_S, C_T and D_T illuminate.

G. The roll right attitude shall be $1.0 \pm 0.3^{\circ}$.

11-200. ATTITUDE INDICATOR, PITCH UP CHANNEL

A. Move the hand controller full aft until the hardstop is contacted.

B. The MASTER WARNING and HARDOVER BOTH indicators in the cockpit shall be illuminated.

C. STD and MODEL indicators on the test cart shall be extinguished.

D. BOTH indicator on the test cart shall be illuminated.

E. Rocket indicators A_T, B_S, C_S, and D_T shall be illuminated.

F. Return the hand controller to the center position and release.

G. The MASTER WARNING and HARDOVER BOTH indicators in the cockpit shall remain illuminated.

H. STD and MODEL indicators on the test cart shall remain extinguished.

I. BOTH indicator on the test cart shall remain illuminated.

J. All rocket indicators shall be extinguished.

K. Press Hardover Reset switch in the cockpit.

L. The HARDOVER BOTH indicator in the cockpit shall be extinguished.

M. STD and MODEL indicators on the test cart shall be illuminated.

N. BOTH indicator on the test cart shall be extinguished.

11-201. ATTITUDE INDICATOR, PITCH DOWN CHANNEL

A. Move the hand controller full forward until the hardstop is contacted.

B. The MASTER WARNING and HARDOVER BOTH indicators in the cockpit shall be illuminated.

C. STD and MODEL indicators on the test cart shall be extinguished.

D. BOTH indicator on the test cart shall be illuminated.

E. Rocket indicators A_S, B_T, C_T, and D_S shall be illuminated.

F. Return the hand controller to the center position and release.

G. The MASTER WARNING and HARDOVER BOTH indicators in the cockpit shall remain illuminated.

H. STD and MODEL indicators on the test cart shall remain extinguished.

I. BOTH indicator on the test cart shall remain illuminated.

J. All rocket indicators shall be extinguished.

K. Press the Hardover Reset switch in the cockpit.

L. The HARDOVER BOTH indicator in the cockpit shall be extinguished.

M. STD and MODEL indicators on the test cart shall be illuminated.

N. Both indicator on the test cart shall be extinguished.

11-202. ATTITUDE INDICATOR, ROLL RIGHT CHANNEL

A. Move the hand controller full right until the hardstop is contacted.

B. The MASTER WARNING and HARDOVER BOTH indicators in the cockpit shall be illuminated.

C. STD and MODEL indicators in the test cart shall be extinguished.

D. BOTH indicator on the test cart shall be illuminated.

E. Rocket indicators A_T, B_T, C_S, and D_S shall be illuminated.

F. Return the hand controller to the center position and release.

G. The MASTER WARNING and HARDOVER BOTH indicators in the cockpit shall remain illuminated.

H. STD and MODEL indicators on the test cart shall remain extinguished.

I. BOTH indicators on the test cart shall remain illuminated.

J. All rocket indicators shall be extinguished.

K. Press Hardover Reset switch in the cockpit.

L. The HARDOVER BOTH indicator in the cockpit shall be extinguished.

M. STD and MODEL indicators on the test cart shall be illuminated.

N. BOTH indicator on the test cart shall be extinguished.

11-203. ATTITUDE INDICATOR, ROLL LEFT CHANNEL

A. Move the hand controller full left until the hardstop is contacted.

B. The MASTER WARNING and HARDOVER BOTH indicators in the cockpit shall be illuminated.

C. STD and MODEL indicators on the test cart shall be extinguished.

D. BOTH indicator on the test cart shall be illuminated.

E. Rocket indicators A_S, B_S, C_T, and D_T shall be illuminated.

F. Return the hand controller to the center position and release.

G. The MASTER WARNING and HARDOVER BOTH indicators in the cockpit shall remain illuminated.

H. STD and MODEL indicators on the test cart shall remain extinguished.

I. BOTH indicator on the test cart shall remain illuminated.

J. All rocket indicators shall be extinguished.

K. Press the Hardover Reset switch in the cockpit.

L. The HARDOVER BOTH indicator in the cockpit shall be extinguished.

M. STD and MODEL indicators on the test cart shall be illuminated.

N. BOTH indicator on the test cart shall be extinguished.

11-204. LOCAL VERTICAL MODE

A. Place the Emergency Gimbal Lock switch in the ON position.

B. The EMERG GIMBALS LOCKED indicator shall be illuminated.

C. Remove the jet engine restraint cables.

D. Apply hydraulic power to the vehicle.

E. Place the Local Vertical switch in the ON position. Apply 28 vdc to test cart TP159 (leg microswitch bypass relay).

F. Adjust the angle computer (with attitude gryo package) for 0° in pitch and roll.

G. Place the Emergency Gimbal Lock switch in the OFF position and momentarily depress the Emergency Gimbal Lock Reset switch.

H. The LOCAL VERTICAL indicator shall remain illuminated.

I. The EMERG GIMBALS LOCKED indicator shall extinguish.

J. The jet engine shall be at $0.0^{\circ} \pm 0.5^{\circ}$ in pitch and roll.

K. Rotate the gyro package from -15° to $+15^{\circ}$ in pitch in 5° steps. At each angle record gyro pitch angle and jet engine pitch angle. Refer to Table 11-11.

TABLE 11-11

GYRO PITCH AND JET ENGINE PITCH ANGLES

Gyro Pitch Angle	Actual	Jet Engine Pitch Angle	Actual
-15°	_____	-15°	_____
-10°	_____	-10°	_____
$- 5^{\circ}$	_____	$- 5^{\circ}$	_____
0°	_____	0°	_____
$+ 5^{\circ}$	_____	$+ 5^{\circ}$	_____
$+10^{\circ}$	_____	$+10^{\circ}$	_____
$+15^{\circ}$	_____	$+15^{\circ}$	_____

NOTE

The jet engine pitch angle must be identical identical to the gyro pitch angle within $\pm$ 0.7°.

L. Return the gyro package to 0°.

M. Rotate the gyro package from -15° to +15° in roll in 5° steps. At each angle record gyro roll angle and jet engine roll angle. Refer to table 11-12.

TABLE 11-12

GYRO ROLL AND JET ENGINE ROLL ANGLES

Gyro Roll Angle	Actual	Jet Engine Roll Angle	Actual
-15°	———	-15°	———
-10°	———	-10°	———
- 5°	———	- 5°	———
0°	———	0°	———
+ 5°	———	+ 5°	———
+10°	———	+10°	———
+15°	———	+15°	———

NOTE

The jet engine roll angle must be identical to the gyro roll angle withing $\pm$ 0.7°.

N. Return the gyro package to 0°.

O. Apply 1 vdc to TP139 ($\ddot{X}_{1,\ 2}$ torquer) and TP141 ($\ddot{Y}_{1,\ 2}$ torquer).

P. The jet engine shall not move.

Q. Remove leads from TP139 and TP141.

11-205. VERTICAL GYRO WITH RESOLVERS ADJUSTMENT

The following adjustments are required whenever the Vertical Gyro with Resolvers is changed.

A. With gyro package mounted on a horizontal plane ($0^{\circ} \pm 6$ min) adjust gyro for a DC null at W and D A8 TP5 (pitch), and W and D A8 TP7 (roll). Also adjust attitude gyro package potentiometer TB1R6 for 1.88 vdc at W and D A6 TP2.

11-206. VERTICAL GYRO WITH RESOLVERS TESTS REQUIRED

The following tests are required after the Vertical Gyro with Resolvers adjustments have been performed.

11-207. LUNAR SIMULATION CHECK

A. Apply 28 vdc to test cart TP154 (ground test relay for lunar simulation loop). Apply 28 vdc to test cart TP159 to bypass leg microswitch.

B. Adjust attitude gyro package to $0 \pm 0.2^{\circ}$ in pitch and roll.

C. Place the Local Vertical switch in the OFF position and momentarily depress the Loc Vert Release switch.

D. Place the Lunar Sim switch in the LUNAR SIM position.

E. Adjust the jet throttle position to give 0 ± 0.5 vdc at weight-drag test point A7 TP2.

F. Place the Emergency Gimbal Lock switch in the OFF position, and momentarily depress the Emergency Gimbal Lock Reset switch.

G. The EMERG GIMBALS LOCKED indicator shall extinguish.

H. The JET STAB indicator shall illuminate.

I. The jet engine shall be at $0^{\circ} \pm 0.8^{\circ}$ in pitch and roll (measure 0 ± 100 mvdc at A9 TP7 and A9 TP3 of weight drag box).

Pitch ACTUAL _____

Roll ACTUAL _____

A9 TP7 ACTUAL _____

A9 TP3 ACTUAL _____

J. Connect a variable DC variable DC voltage initially set at 0 vdc to TP139 ($\ddot{X}_{1,\ 2}$ torquer).

K. Rotate the pitch gyro to $5.0^{\circ} \pm 0.1^{\circ}$ (pitch up).

L. The top of the jet engine will rotate forward.

M. Measure and record the voltage at weight drag test points A9 TP5 ($\ddot{X}_1$) and A9 TP6 ($\ddot{X}_2$). (0° reading).

N. Increase the DC voltage at TP139 until the reading at A9 TP7 is within 12 mvdc of the reading obtained on this test point in Step F.

O. The average of the voltages at weight drag test points A9 TP5 ($\ddot{X}_1$) and A9 TP6 ($\ddot{X}_2$) shall change -0.356 ± 0.080 vdc.

P. The voltage at TP139 shall be $+1.33 \pm 0.30$ vdc.

Q. Rotate the pitch gyro to $10.0^{\circ} \pm 0.1^{\circ}$ (pitch up).

R. The top of the jet engine will rotate forward.

S. Increase the DC voltage at TP139 until the reading at A9 TP7 is within 12 mvdc of the reading obtained on this test point in Step F.

T. The average of the voltages at weight drag test points A9 TP5 ($\ddot{X}_1$) and A9 TP6 ($\ddot{X}_2$) shall change -0.712 ± 0.080 vdc.

U. Return the gyro to $0^{\circ} \pm 0.2^{\circ}$ and the torquer voltage at TP139 to 0 vdc.

V. Rotate the pitch gyro $5.0 \pm 0.1^{\circ}$ (pitch down).

W. The top of the jet engine will rotate backward.

X. Increase the DC voltage at TP139 negatively until the reading at A9 TP7 is within 12 mvdc of the reading obtained on this test point in Step F.

Y. The average of the voltages at weight drag test points A9 TP5 ($\ddot{X}_1$) and A9 TP6 ($\ddot{X}_2$) shall change $+0.356 \pm 0.080$ vdc.

Z. The voltage at TP139 shall be -1.33 ± 0.30 vdc.

AA. Rotate the pitch gyro to $10.0^{\circ} \pm 0.1^{\circ}$ (pitch down).

AB. The top of the jet engine will rotate backward.

AC. Increase the DC voltage at TP139 negatively until the reading at A9 TP7 is within 12 mvdc of the reading obtained on this test point in Step F.

AD. The average of the voltages at weight drag test points A9 TP5 ($\ddot{X}_1$) and A9 TP6 ($\ddot{X}_2$) shall change $+ 0.712 \pm 0.080$ vdc.

AE. Remove the lead from TP139.

AF. Return the attitude gyro package to 0° pitch and roll.

AG. Connect a variable DC voltage initially set at 0 vdc to TP141 ($\ddot{Y}_{1,2}$) torquer.

AH. Rotate the roll gyro to $5.0^{\circ} \pm 0.1^{\circ}$ (roll right).

AI. The top of the jet engine will rotate to the left as viewed from the aft deck.

AJ. Measure and record the voltage at weight drag test points A9 TP2 ($\ddot{Y}_1$) and A9 TP4 ($\ddot{Y}_2$). (0° reading).

AK. Increase the DC voltage at TP141 until the reading at A9 TP3 is within 12 mvdc of the reading obtained on this test point in Step F.

AL. The average of the voltages at weight drag test points A9 TP2 ($\ddot{Y}_1$) and A9 TP4 ($\ddot{Y}_2$) shall change +0.356 ± 0.080 vdc.

AM. The voltage at TP141 shall be -1.33 ± 0.30 vdc.

AN. Rotate the roll gyro to 10.0° ± 0.1° (roll right).

AO. The top of the jet engine will rotate left as viewed from the aft deck.

AP. Increase the DC voltage at TP141 until the reading at A9 TP3 is within 12 mvdc of the reading obtained on this test point in Step F.

AQ. The average of the voltages at weight drag test points A9 TP2 ($\ddot{Y}_1$) and A9 TP4 ($\ddot{Y}_2$) shall change + 0.712 ± 0.080 vdc.

AR. Rotate the roll gyro to 5.0° ± 0.1° (roll left).

AS. The top of the jet engine will rotate to the right as viewed from the aft deck.

AT. Increase the DC voltate at TP141 until the reading at A9 TP3 is within 12 mvdc of the reading obtained on this test point in Step F.

AU. The average of the voltages at weight drag test points A9 TP2 ($\ddot{Y}_1$) and A9 TP4 ($\ddot{Y}_2$) shall change -0356 ± 0.080 vdc.

AV. The voltage at TP141 shall be +1.33 ± 0.30 vdc.

AW. Rotate the roll gyro 10.0° ± 0.1° (roll left).

AX. The top of the jet engine will rotate to the right as viewed from the aft deck.

AY. Increase the DC voltage at TP141 until the reading at A9 TP3 is within 12 mvdc of the reading obtained on this test point in Step F.

AZ. The average of the voltage at weight drag test points A9 TP2 (Y_1) and A9 TP4 (Y_2) shall change -0.712 ± 0.080 vdc.

AAA. Remove lead from TP141.

11-208. DIRECTIONAL GYRO ADJUSTMENTS

The following adjustments are required whenever the Directional gyro is changed.

11-209. DIRECTIONAL GYRO INITIAL POTENTIOMETER SETTINGS

A. The primary electronics attitude gyro gain potentiometer shall be adjusted for maximum sensitivity in yaw.

B. The primary electronics attitude gyro null potentiometer shall be adjusted to compensate for the null in the gyro.

11-210. DIRECTIONAL GYRO TEST REQUIRED

The following tests are required after the Directional gyro adjustments have been performed.

11-211. ATTITUDE INDICATOR, YAW CHANNEL

A. Place the attitude gyro package on the yaw attitude table in the yaw axis.

B. Adjust the yaw attitude table for 0° in yaw.

C. Attitude indicator (3 axis ball) shall read $0^\circ \pm 0.5^\circ$ in yaw.

NOTE

The trim adjustment (yaw axis) in the cockpit may be utilized to meet this requirement.

D. The horizontal needle shall indicate zero.

E. Rotate the yaw attitude table as indicated in table 11-13 and record the measurements.

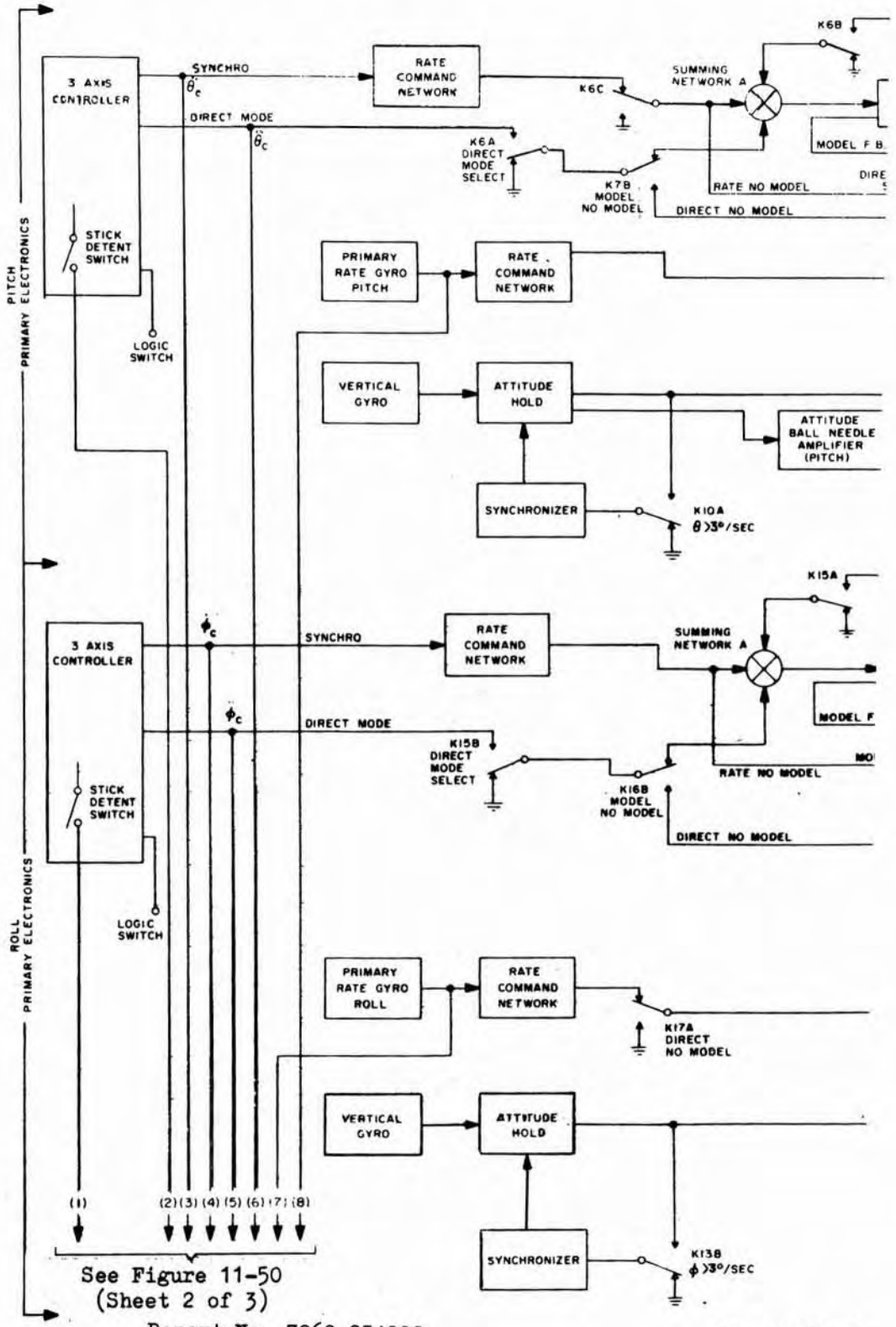
TABLE 11-13

YAW ATTITUDE INDICATOR TEST REQUIREMENTS

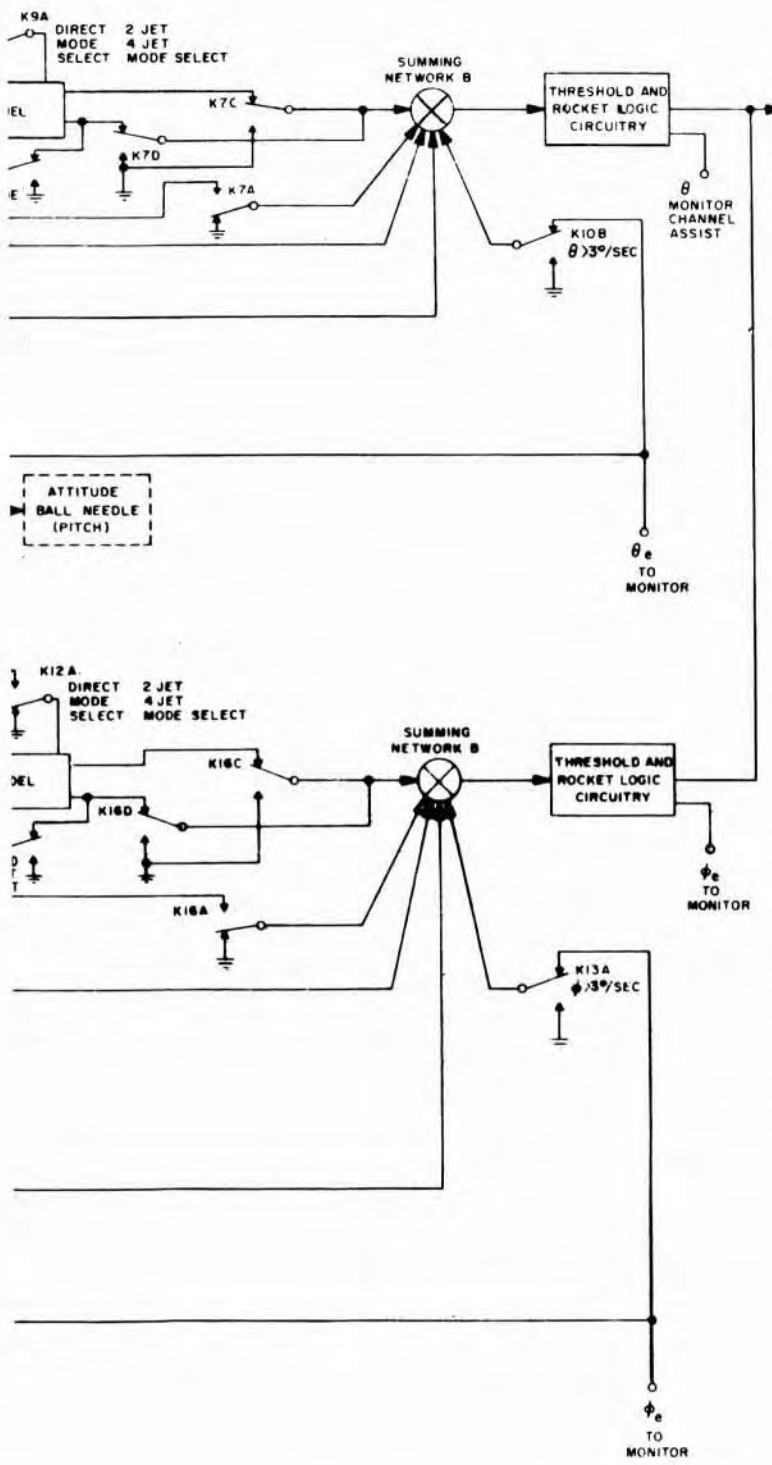
Rotate the Yaw Attitude Table to the Following Positions		REQUIREMENTS 3 Axis Ball Attitude Indicator	ACTUAL
Yaw	0°	0° ± 1°	
	30°	30° ± 1°	
	60°	60° ± 1°	
	90°	90° ± 1°	
	120°	120° ± 1°	
	150°	150° ± 1°	
	180°	180° ± 1°	
	210°	210° ± 1°	
	240°	240° ± 1°	
	270°	270° ± 1°	
	300°	300° ± 1°	
	330°	330° ± 1°	
Yaw	360°	360° ± 1°	

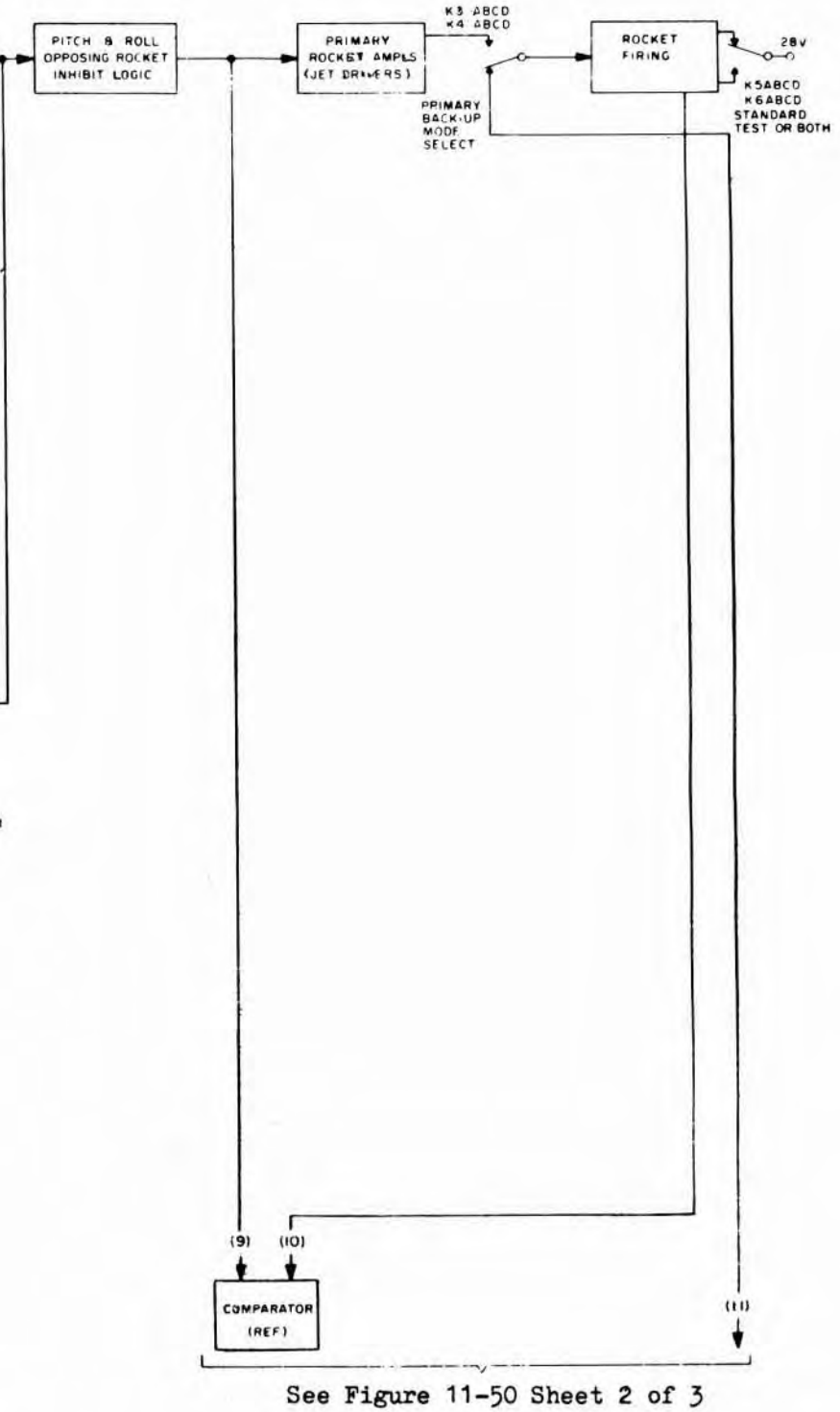
F. The measurements shall be within the limits specified in table 11-13.

G. Conduct yaw attitude calibration with instrumentation.



See Figure 11-50 (Sheet 2 of 3)





See Figure 11-50 Sheet 2 of 3

Figure 11-49

itude Control Electronics Functional Block Diagram (Sheet 1 of 3)

See Figure 11-50 Sheet 1 of 3

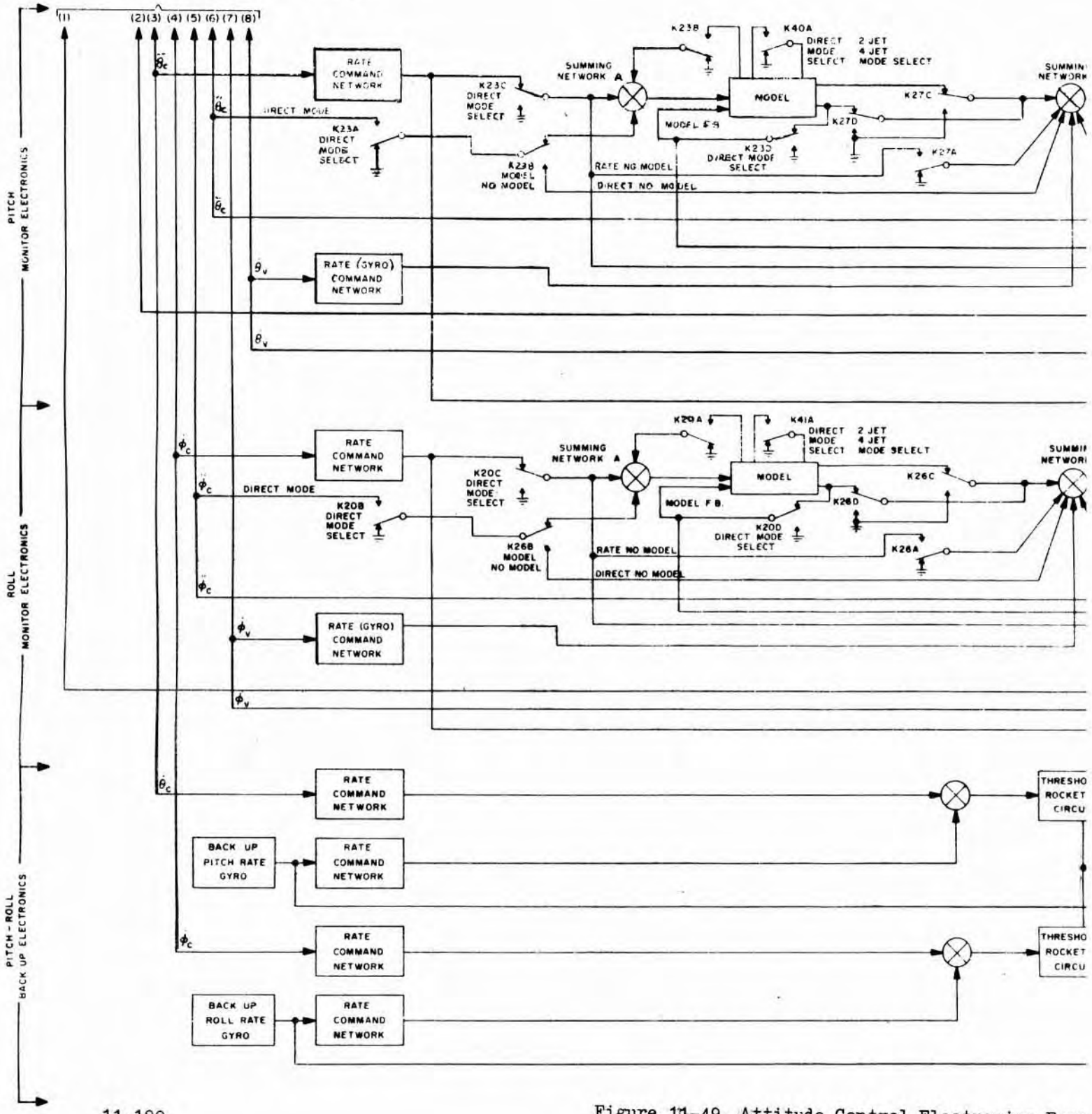
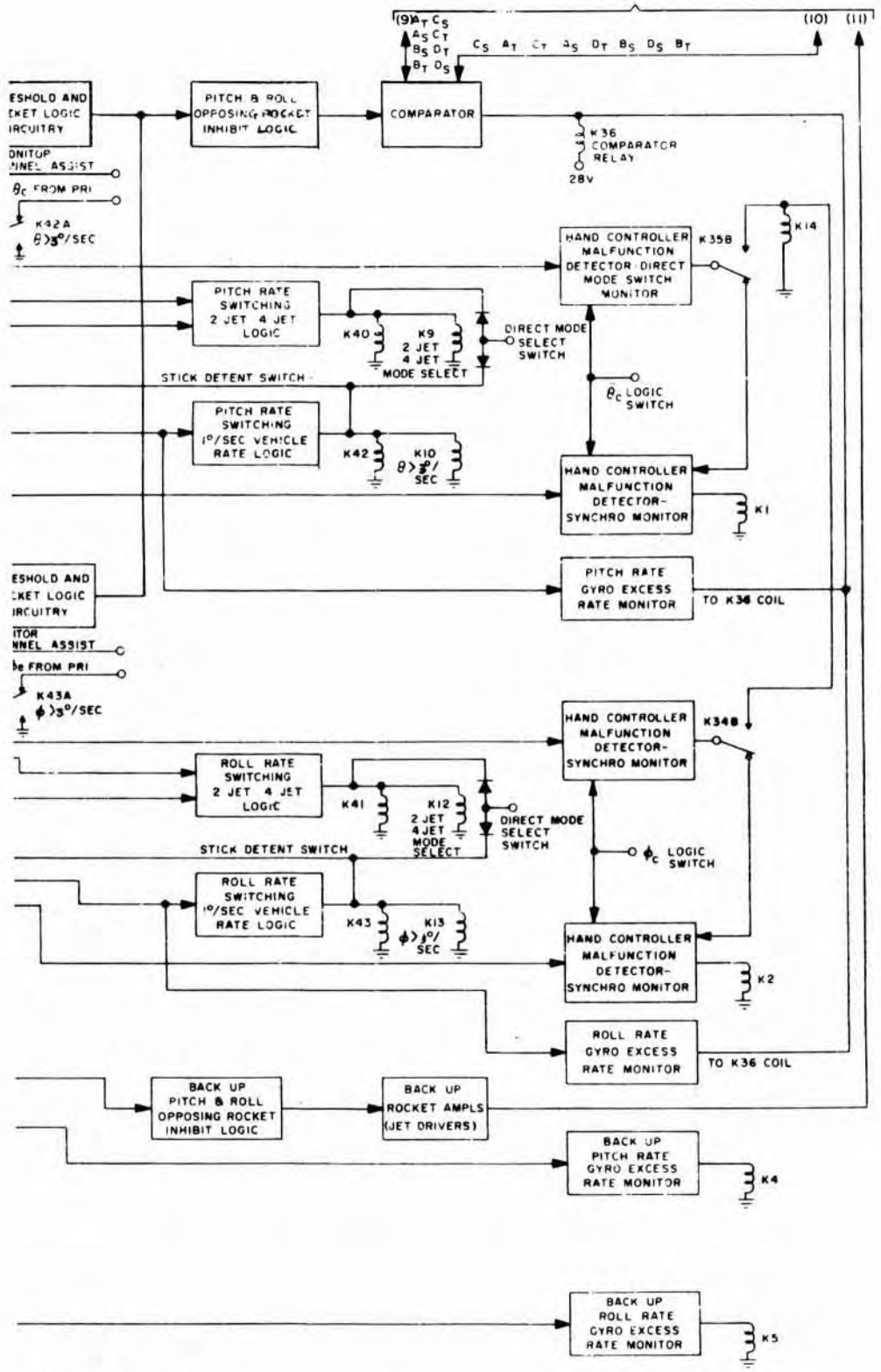
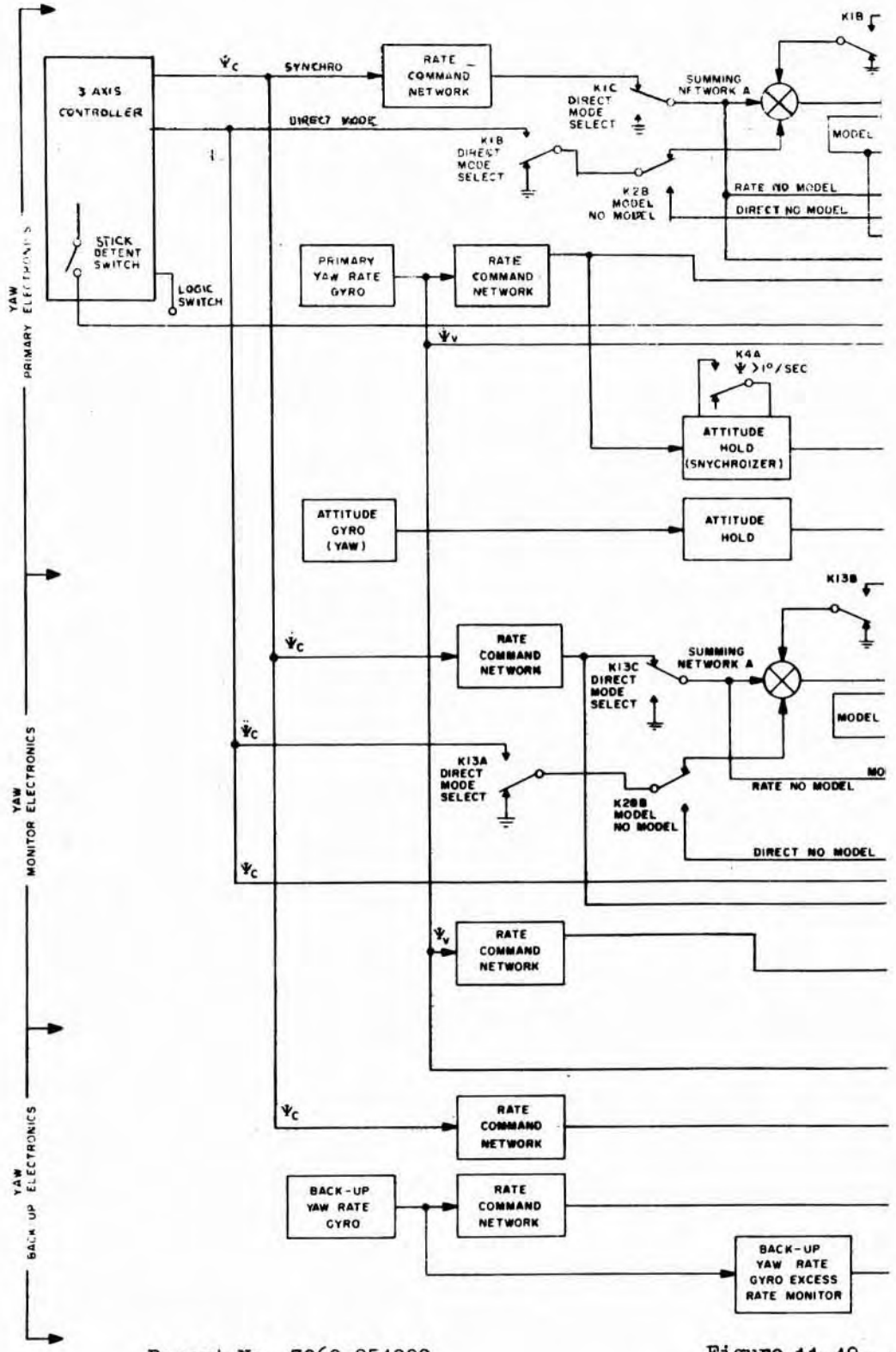


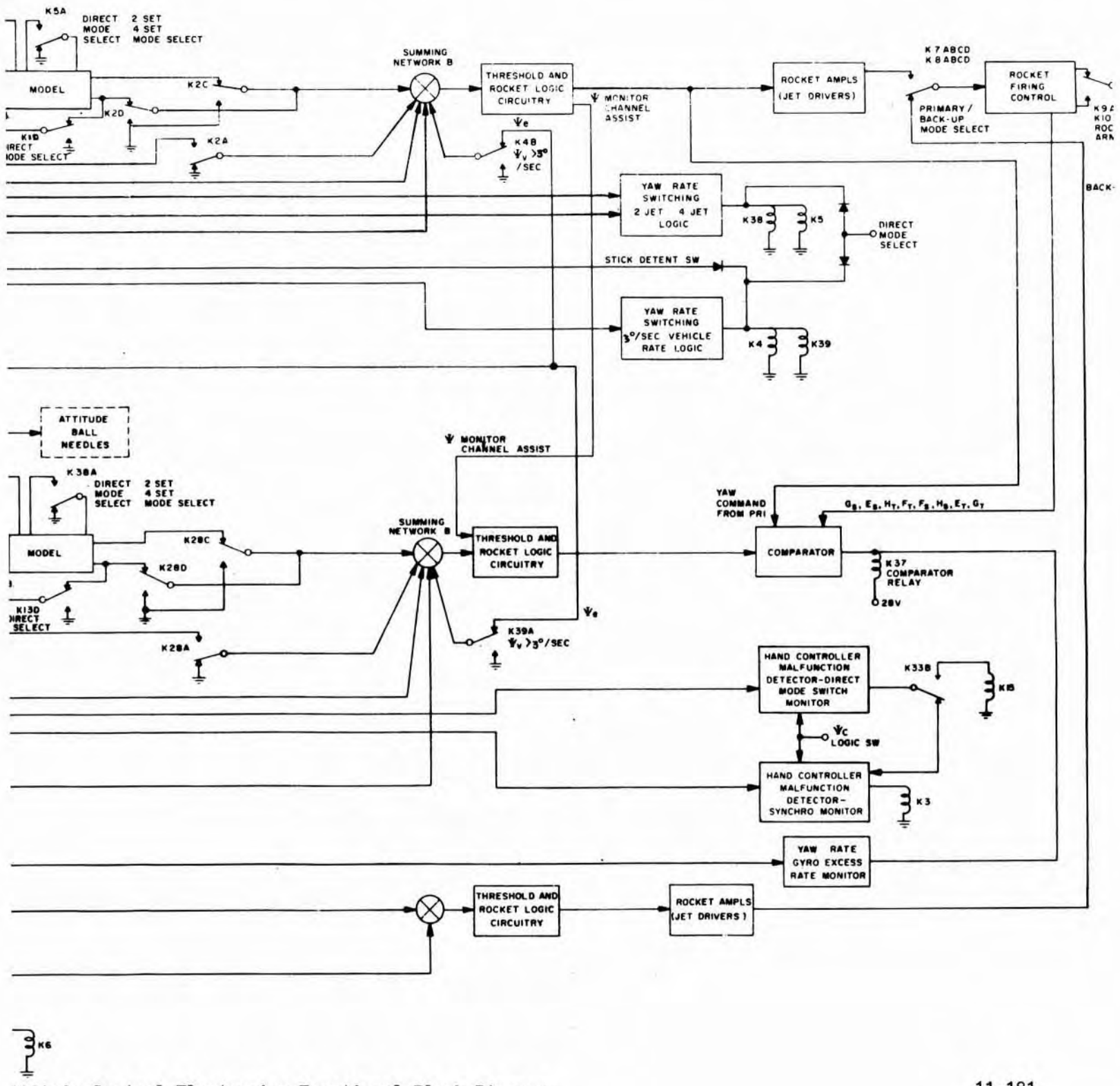
Figure 11-49. Attitude Control Electronics Func (Sheet 2 of 3)

See Figure 11-50 Sheet 1 of 3

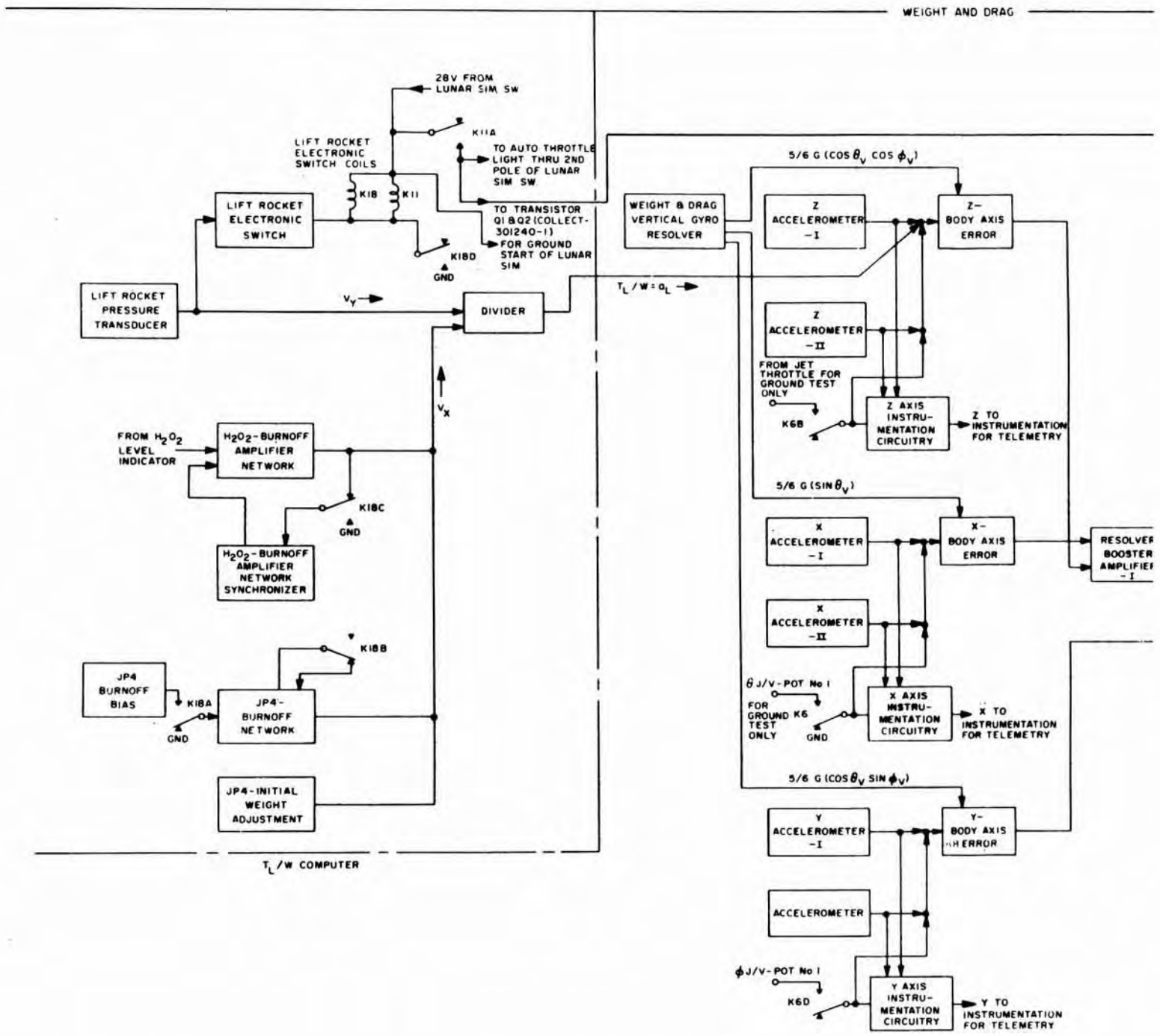


Block Diagram





ttitude Control Electronics Functional Block Diagram
(Sheet 3 of 3)



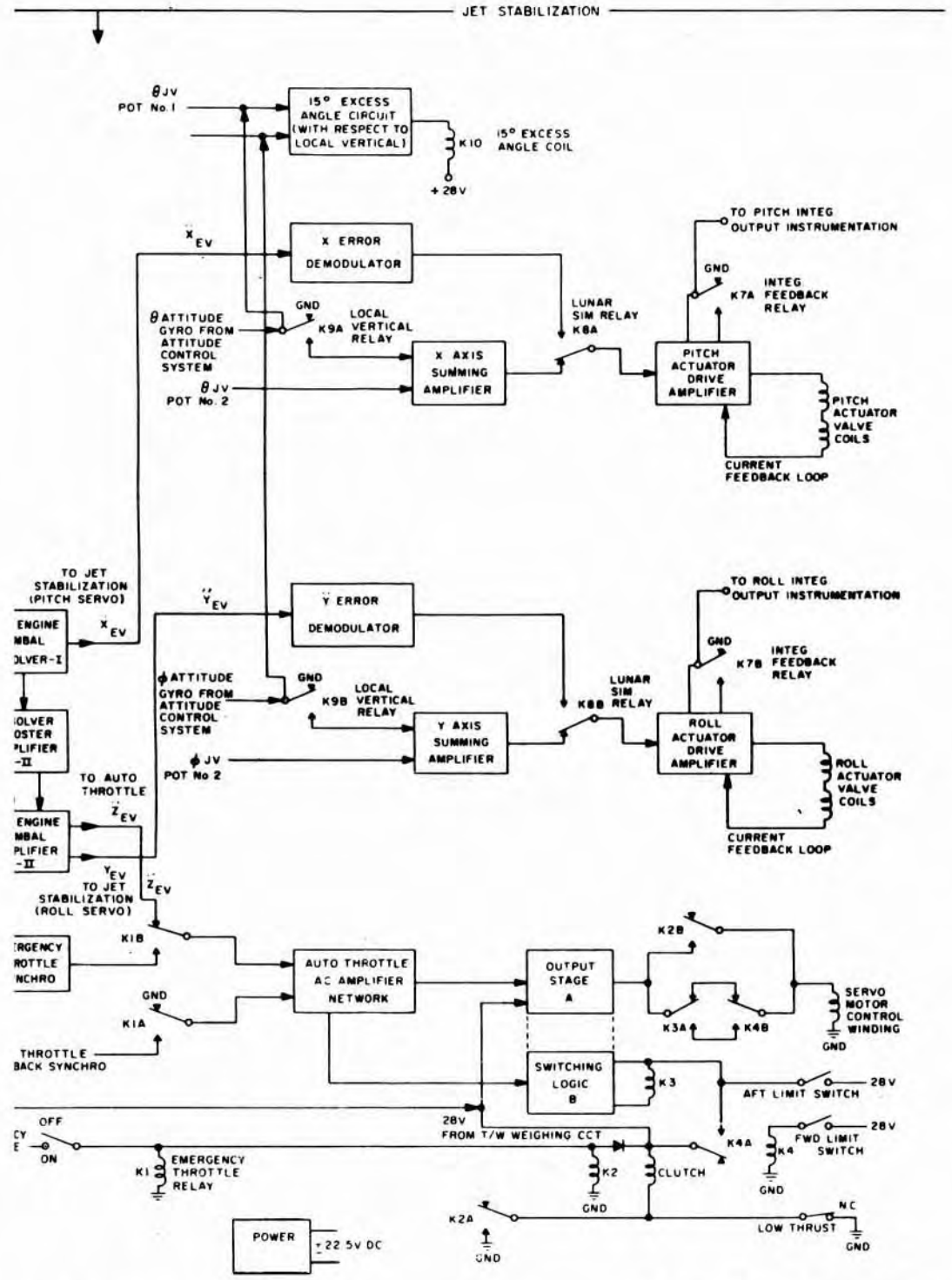


Figure 11-50. Weight and Drag, Jet Stabilization, and Aut

tle-Electronic Block Diagram

SECTION XIII

SECTION XII

INSPECTIONS AND PREVENTIVE MAINTENANCE

12-1. SCOPE OF SECTION

12-2. Inspection intervals and preventive maintenance procedures are provided for the LLTV components, by system, in table 12-1. References are provided for the procedures to be followed in performing the inspections. Refer also to LLTV Preflight Checklist Number 7260-931005 and Postflight Checklist Number 7260-931010. Daily inspections are usually performed as part of preflight and postflight inspections. Some items of inspection are also included in the LLTV Turnaround Checklist Number 7260-931012.

System and Component	Check-Service-Maint Performed	Intervals									Remarks
		Daily	45	90	135	180	225	270	315	360	
STRUCTURE											
Complete Structure	Visually inspect for damage, loose bolts, corrosion, etc.	✓									
Welds	Visually inspect for condition.		✓	✓	✓	✓	✓	✓	✓	✓	
Landing Strut	Check fluid level-fill as required.		✓	✓	✓	✓	✓	✓	✓	✓	
Gimbal Ring	X-ray and zyglo									✓	
Welds	Inspect with magnifying glass					✓				✓	Use 10-power magnification
Trunnions	X-ray									✓	
Welds	Dye penetrant					✓				✓	
EJECTION SEAT											
Complete installation	Inspect for damage, security and cleanliness.	✓									
Parachute	Inspect for damage.	✓									
Complete seat inspection	Remove, disassemble and inspect.			✓		✓		✓		✓	Refer to Weber Tech Manual DR5773-1
Parachute cartridge	Fire for pressure check									✓	
OXYGEN											
Gage	Check-1800 psi minimum	✓									
Oxygen bottle	Recharge after each use.	✓									
Bottle and regulator	Inspect for damage, etc.					✓				✓	
HYDRAULIC GIMBAL											
Tank, pump, valves, tubing, actuators, accumulator, etc.	Visually inspect for security, cleanliness, damage, etc.	✓									
Reservoir tank	Check level-fill as required.	✓									
Filters	Check condition/replace			✓		✓		✓		✓	
Relief valves	Pressure check			✓		✓		✓		✓	Refer to Ground Test Procedure Number 7260-928055.

System and Component	Check-Service-Maint Performed	Daily	45	90	135	180	225	270	315	360	Remarks
HYDRAULIC GIMBAL (Cont)											
Fluid analysis	Sample and particle count.			▨		▨		▨		▨	Refer to Ground Test Procedure Number 7260-928055
Accumulator press transducer	Calibration			▨		▨		▨		▨	Refer to Ground Test Procedure Number 7260-928057
Hydraulic press transducer	Calibration			▨		▨		▨		▨	Refer to Ground Test Procedure Number 7260-928057
JET ENGINE											
Engine mount bearings, etc.	Inspect for security & cleanliness.	▨									Refer to CF700-2CV Maintenance Manual SEI-133 and Jet Engine Ramp Checklist Number 7260-931004.
Roll/pitch actuators	Check for security and cleanliness.	▨									
Air inlet bellmouth	Check for cleanliness, damage and security.	▨									
Air impingement starter	Check for security and cleanliness.	▨									
General operation	Check for overall operation					▨				▨	
Control levers, cables	Check for freedom of movement, stop security, etc.	▨									
Autothrottle gears	Check and lube.				▨			▨			
Oil Filter	Change			▨		▨		▨		▨	
Engine Oil	Change					▨				▨	
Fuel tanks, valves, tubing	Check for damage, security, leaks, security, etc.	▨									
Fuel filter	Inspect, clean -change as required.			▨		▨		▨		▨	
Fuel tanks	Pressure and leakage check									▨	Refer to Ground Test Procedure Number 7260-928053.
Throttle control, actuators, lines, crossover valve, temp compensator	Check for damage, security, leaks, cleanliness, etc.	▨									Refer to Ground Test Procedure Number 7260-928052.
Throttle control, electric	Alignment		▨	▨	▨	▨	▨	▨	▨	▨	
Yaw compensator	Check for damage, leakage, etc.	▨									
Oil pressure transducer	Check condition and calibrate.			▨		▨		▨		▨	Refer to Ground Test Procedure Number 7260-928057.
EGT transducer	↕			▨		▨		▨		▨	↕
Gas generator tachmometer	Check condition and calibrate.			▨		▨		▨		▨	Refer to Ground Test Procedure Number 7260-928057.

System and Component	Check-Service-Maint Performed	Intervals									Remarks
		Daily	45	90	135	180	225	270	315	360	
JET ENGINE (Continued)											
Compressor discharge transducer	Check condition and calibrate			▨		▨		▨		▨	Refer to Ground Test Procedure Number 7260-928057.
Fan RPM tachometer	↕			▨		▨		▨		▨	↕
Fuel level sensors	↕			▨		▨		▨		▨	↕
Tank pressure transducer	Check condition and calibrate			▨		▨		▨		▨	Refer to Ground Test Procedure Number 7260-928057.
Low oil pressure switch	Check condition			▨		▨		▨		▨	
ROCKET PROPULSION											
H_2O_2 tanks, helium tanks, check valves, relief valves, rockets, tubing, transducers, etc.	Check for cleanliness, security, damage, leakage, caps, et. Service as required.	▨									
Propulsion system	Decomposition check		▨	▨	▨	▨	▨	▨	▨	▨	Refer to 30-Day Functional and Leakage Check, Report Number 7260-931013.
Entire propulsion system	Functional and leakage check		▨	▨	▨	▨	▨	▨	▨	▨	
H_2O_2 high pressure relief valve	Pressure check			▨		▨		▨		▨	
Helium filters	Check and replace			▨		▨		▨		▨	
Helium bottle	Proof test									▨	
H_2O_2 tanks	Proof test									▨	
Attitude rocket transducers	Check and calibrate			▨		▨		▨		▨	Refer to Ground Test Procedure Number 7260-928057.
Lift rocket transducers	↕			▨		▨		▨		▨	↕
H_2O_2 tank pressure transducer	↕			▨		▨		▨		▨	↕
Helium tank temp thermistor	↕			▨		▨		▨		▨	↕
H_2O_2 level sensors	↕			▨		▨		▨		▨	↕
Helium tank pressure transducer	Check and calibrate			▨		▨		▨		▨	Refer to Ground Test Procedure Number 7260-928057.
Helium tank pressure switch	Check condition			▨		▨		▨		▨	

TABLE 12-1. INSPECTION AND PREVENTIVE MAINTENANCE SCHEDULE

System and Component	Check-Service-Maint Performed	Intervals									Remarks
		Daily	45	90	135	180	225	270	315	360	
ELECTRICAL											
Generator, inverters, relays, regulator, battery, connectors	Check for damage, security, cleanliness, general operation	▨									
Battery	Capacity check		▨	▨	▨	▨	▨	▨	▨	▨	Refer to NASA battery charging procedure.
All electrical connectors and wires	Check condition, security, etc.					▨				▨	
Circuit breakers	Check condition, operation		▨	▨	▨	▨	▨	▨	▨	▨	
AC/DC voltmeters	Check operation	▨									
DC failure circuit	Calibrate			▨		▨		▨		▨	Refer to Ground Test Procedure Number 7260-928057.
AC failure circuit	Calibrate			▨		▨		▨		▨	Refer to Ground Test Procedure Number 7260-928057.
COMM/DATA INSTRUMENTATION											
UHF transceiver	Check connectors for condition, security. Check operation.	▨									
Intercomm		▨									
Radar altimeter/doppler		▨									
AC/DC conditioner		▨									
PCM encoder	Check connectors for condition, security. Check operation.	▨									
Radar altimeter/doppler	Calibrate			▨		▨		▨		▨	Refer to Ryan manuals.
AC/DC conditioner	Calibrate			▨		▨		▨		▨	Refer to Ground Test Procedure Number 7260-928057.
PCM encoder	Calibrate			▨		▨		▨		▨	
Anemometer	Calibrate			▨		▨		▨		▨	
Wind direction device	Calibrate			▨		▨		▨		▨	
Angle of attack device	Calibrate			▨		▨		▨		▨	Refer to Ground Test Procedure Number 7260-928057.

TABLE 12-1. INSPECTION AND PREVENTIVE MAINTENANCE SCHEDULE

System and Component	Check-Service-Maint Performed	Intervals									Remarks
		Daily	45	90	135	180	225	270	315	360	
AVIONICS											Refer to Avionics Checklist No. 7260-931020.
ACS primary electronics unit	Check connectors, wires for condition and security.	///									
ACS backup electronics unit		///									
ACS monitor electronics unit		///									
Drag compensation unit		///									
Accelerometers		///									
Gyros		///									
Misc ACS components	Check connectors, wires for condition and security.	///									
Attitude Control System	Alignment		///	///	///	///	///	///	///	///	
Jet throttle and autothrottle	Alignment		///	///	///	///	///	///	///	///	
Lunar simulation	System check		///	///	///	///	///	///	///	///	
Attitude and rate gyros	Calibrate			///		///		///		///	
Accelerometers	Calibrate			///		///		///		///	
Avionics test cart	Verification of test cart			///	///	///	///	///	///	///	
Hand controller	Operational check	///									
H_2O_2 Remaining indicator	Calibrate			///		///		///		///	Refer to Ground Test Procedure Number 7260-928057.
Thrust/Weight indicator	Calibrate			///		///		///		///	
Attitude indicator	Calibrate			///		///		///		///	Refer to Ground Test Procedure Number 7260-928057.
Annunciator panel indicators	Light test	///									

APPENDIX A

APPENDIX A

ENGINEERING DRAWINGS

A-1. INTRODUCTION.

A-2. Table A-1 provides a partial listing of Bell engineering drawings for the Lunar Landing Training Vehicle. The listing is generally formatted according to system and provides the major drawings. Refer to the Numerical Index, Report Number 7260-950010 for a complete listing, by drawing number, of all components for the LLTV.

TABLE A-1

ENGINEERING DRAWING LIST

Title	Drawing Number
Lunar Landing Training Vehicle Assembly	7260-099001
Structural	
Aft Structural Section Installation	7260-153001
Center Body Assembly	7260-152001
Equipment Platform Installation	7260-153004
Forward Section Structural Installation & Assembly	7260-150001
Gimbal Installation	7260-421001
Leg Structural Installation	7260-155001
Strut Landing Installation	7161-191005

TABLE A-1 (Continued)

Ejection Seat	
Enclosure, Cockpit Installation	7260-150008
Seat Installation	7260-501001
Oxygen System	
Oxygen System Installation	7260-501001
Oxygen Equipment	7260-501002
Hydraulic Gimbal	
Hydraulic System Power Source Installation	7161-382003
Hydraulic Actuators Installation	7260-382004
Hydraulic Actuator	7260-390008
Jet Engine	
Engine Installation	7260-421010
Jet Fuel System Installation	7260-424001
Power Control Installation	7260-435001
Engine Electrical Installation & Wiring	7260-200004
Rocket Propulsion	
Rocket Propulsion System	7260-460001
Propulsion System Installation	7260-460003
Tank Assembly, Propellant	7260-471001
Tank Pressure	7260-471009
Thrust Unit, 90-Pound, Attitude Control	7161-470020
T-Handle Lift Rocket Control Installation	7260-541001
Cockpit Indicators	
Pedestal Assembly, Instrument Panel	7260-561004

TABLE A-1 (Continued)

Instrument Box	7260-561021
Instrument Panel Assembly	7260-561022
Wind Direction Indicator - Anemometer Installation	7260-561023
Wiring Diagram - Warning Lights	7260-201005
Wiring Diagram - Miscellaneous	7260-201003
Master Warning Control	7260-301700
Electrical	
Electrical Installation Aft Platform	7260-200006
Electrical Equipment Installation & Wiring	7260-200001
Wiring Diagram, Power Generation & Distribution	7260-201001
Inverter Installation Aft Structure	7260-153502
Inverter Installation	7260-200002
Battery	7260-202002
Communications/Data Instrumentation	
Electrical Equipment Installation & Wiring	7260-200001
Electrical Installation Aft Platform	7260-200006
AC/DC Conditioner	7260-242002
Wiring Diagram Instrumentation	7260-242003
Instrumentation Electrical Installation	7260-242001
Attitude Transducers Installation	7260-244015
Instrumentation Package	7260-262010
Wiring Diagram, Radio & Radar	7260-201002
Console, Pilots, Installation	7260-561001
Transceiver, Model TR-31 UHF	7260-561019

TABLE A-1 (Continued)

AVIONICS ACS	
Electronics Package Installation	7260-301001
Attitude Gyro Installation	7260-301050
Wiring Diagram Avionics System	7260-201004
Drag Compensation System	7260-301010
Back-Up Electronics, Rocket Valve Amplifier & Power Supply	7260-301030
ACS - Primary Electronics	7260-301050
ACS - Monitor Electronics	7260-301070
Attitude Controller Mounting Box Installation	7260-541503
Attitude Control Assembly	7260-541006
Accelerometer, Mount Assembly	7260-561002