Collins 972S-2 Autopilot Bench Test Set

Rockwell International

description

Collins General Aviation Division

Printed in USA

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description

1. PURPOSE OF EQUIPMENT

The 972S-2 Autopilot Bench Test Set (CPN 622-1668-001) is shown in figure 1. The 972S-2 test set, used with a vom and an oscilloscope, provides bench test checkout and troubleshooting of the Collins Low Profile Flight Control System (AP-106/AP-107). The 972S-2, when used with the 999U-1 Test Set Adapter, can also be used to test and troubleshoot the computer/control units used in helicopter autopilot systems.

2. EQUIPMENT SUPPLIED

Table 1 lists the equipment supplied with the 972S-2 Autopilot Bench Test Set.

3. SPECIFICATIONS

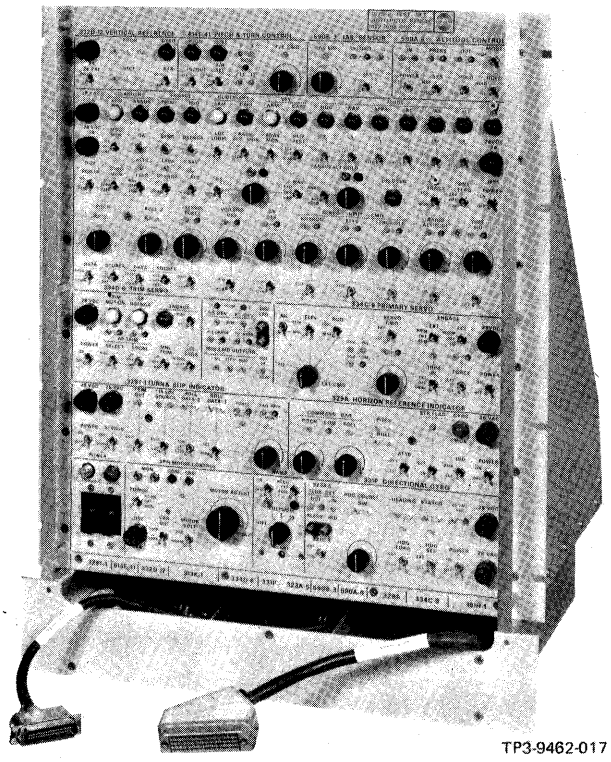
The physical and electrical specifications for the 972S-2 are presented in table 2.

4. DESCRIPTION OF EQUIPMENT

The 972S-2 Autopilot Bench Test Set is rack-mounted with a drawer for cable and instruction book storage. Mounted on the front panel of the 972S-2 test set are 131 test jacks, 85 toggle switches, 21 variable resistors, 12 fuses, 26 indicator lamps, and 2 circuit breakers. Sixteen multipin connectors and associated cables from the 972S-2 test set are stored in the cable drawer. The 115-V ac power jack and the +28-V dc power jack are mounted on the rear of the test set. The 972S-2 test set has its own internal power supplies which provide ±10, ±13, and ±15 V dc and 26 V ac. The 972S-2 test set also has a linear ramp generator which simulates pitch and roll data from the 332D-12 Vertical Gyro. The ramp generator circuit consists of an operational amplifier integrator with switchable linear ramp outputs of 0.1, 1, and 10 volts/second.

5. PRINCIPLES OF OPERATION

The 972S-2 test set provides access to the primary interface signals between components of the flight control system. Switches and variable resistors on the front panel of the 972S-2 test set provide system checkout either with signals from the flight control equipment or with signals derived from the 972S-2 test set.



972S-2 Autopilot Bench Test Set
Figure 1

The flight control system can be tested either as a system or as individual components. The units to be tested must be removed from the aircraft. The multipin connectors from the 972S-2 test set are connected to the appropriate units of the flight control system. The flight control system or an individual component can then be tested with the test procedures provided in the maintenance and repair sections of the associated autopilot instruction books.

Table 1. 972S-2 Autopilot Bench Test Set, Equipment Supplied.

TYPE NUMBER	DESCRIPTION	COLLINS PART NUMBER (CPN)
972S-2	Autopilot bench test set	622-1668-001
	Front test card for 913K-1	618-3758-001
	Back test card for 913K-1	618-3759-001
	Cable, 28-V dc power, 2-conductor (Service Bulletin No 1)	621-8048-001
	Cable, 115-V, 400-Hz power, 3-conductor (Service Bulletin No 1)	621-8049-001

Table 2. 972S-2 Autopilot Bench Test Set Specifications.

CHARACTERISTICS	SPECIFICATION
Physical size	533.40 mm (21.0 in) high
	482.60 mm (19.0 in) wide
	381.00 mm (15.0 in) deep
	88.90 mm (3.5 in) vertical rack space for cable drawer
Weight	14.515 kg (32 lb)
Cooling	Convection
Power requirement	115 V, 400 Hz, 3 A maximum +28 Vdc, 15 A maximum
Duty cycle	Continuous
Mounting	Rack mounted

Collins 972S-2 Autopilot Bench Test Set

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Record of Revisions

RETAIN THIS RECORD IN THE FRONT OF MANUAL.
ON RECEIPT OF REVISIONS, INSERT REVISED PAGES IN THE MANUAL, AND ENTER DATE INSERTED AND INITIALS.

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1. GENERAL

Tests in this section are performed to ensure that the 972S-2 Autopilot Bench Test Set operates properly. Any malfunctions are isolated to a faulty connector, component, or wire by following the test procedures in this section and referring to the front panel views and the schematic diagrams.

2. TEST EQUIPMENT AND POWER REQUIREMENTS

2.1 Test Equipment

Table 1 lists the test equipment required to perform testing and troubleshooting on the 972S-2 test set.

2.2 Power Requirements

During the testing, various signals and voltages are routed through the 972S-2 test set to check circuit functions. These signals are specified during the test procedures and are supplied by the 972S-2 test set power supplies.

3. TESTING AND TROUBLESHOOTING

3.1 972S-2 Autopilot Bench Test Set

3.1.1 General

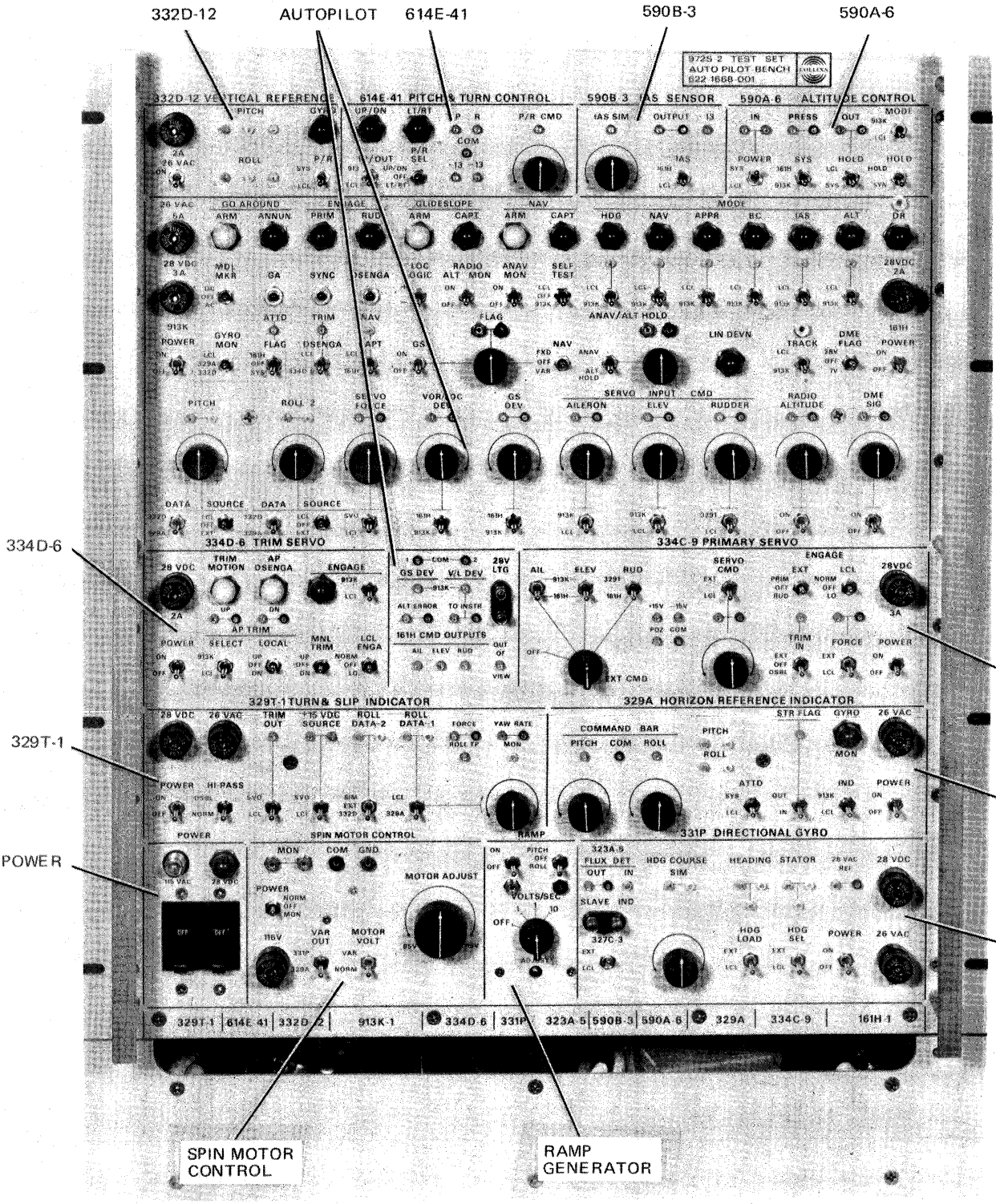
The test procedures for the 972S-2 test set are presented in tables 2 and 3. If a complete check of the 972S-2 test set is required, all procedures in tables 2 and 3 should be performed. If only a certain functional area of the 972S-2 test set is to be checked, first perform the procedures in table 2 and then perform the procedures under the desired functional area in table 3.

The test procedures for power and ac signal phasing are presented in table 2. Instructions for performing the tests in table 2 and the expected correct results are given in the PROCEDURE and DESIRED RESULTS columns. Do not set any switch or control to a new position unless directed to do so. Figure 1 is a photograph of the front panel of the 972S-2 test set. The functional areas of the 972S-2 test set are keyed for ease of identification. Refer to the 972S-2 parts list section (Collins part number 523-0764830) of this instruction book for reference designators of the 972S-2 test set controls and indicators.

Test procedures for the individual functional areas shown in figure 1 are presented in table 3. Set the

Table 1. Test Equipment Required.

TEST EQUIPMENT	REPRESENTATIVE TYPE	MINIMUM SPECIFICATIONS
Voltohmmeter	Triplett Model 630	0-100 kΩ, 0 to 30 Vdc, 0 to 30 Vac, 20 kΩ/volt input impedance.
Oscilloscope	Tektronix 545	Dual-trace, triggered sweep, at least 0.5 ms/division sweep and 0.1 V/division deflection.
Dc power supply		+28 Vdc, 15 A maximum.
Ac power supply		115 V, 400 Hz, 3 A maximum.



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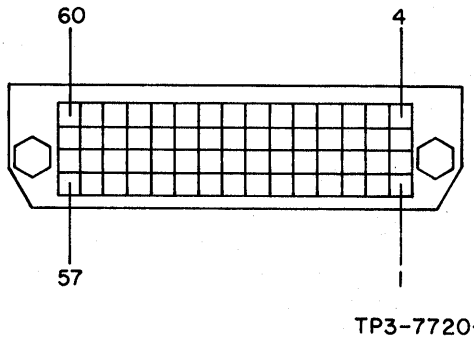
972S-2 Autopilot Bench Test Set, Functional Test Areas
Figure 1

switch or control to the position given in the SWITCH/CONTROL SETTING column and measure the results at the points given in the TEST POINTS column. The functional area tests are grouped as follows:

1. 590A-6
2. 590B-3
3. 614E-41
4. 332D-12
5. Autopilot (includes 161H-1 and 913K-1)
6. 334C-9
7. 334D-6
8. 329A-4/4V
9. 329T-1
10. 331P-1 (includes 323A-5 and 327C-3)
11. Ramp generator
12. Spin motor control
13. Lamp tests

The procedures in test 13 are included to provide a test of all indicator lamps not covered in other test procedures in table 3. The user may perform any one of the tests in table 3 without performing all of the tests; however, each step within the test must be performed in sequence. Do not set any switch or control to a new position unless directed to do so. The pin locations for the 161H-1 multipin connector are shown in figure 2. Pin locations for all other connectors in the cable storage drawer of the 972S-2 test set are marked on the connectors.

If any test in table 2 or 3 fails, isolate the malfunction by using the schematic diagram (figure 3) and perform continuity and/or voltage checks on the components in the immediate circuit. Remove and replace



161H-1/P1 Connector Pin Location (972S-2)
Figure 2

any component found to be faulty. When rotating potentiometers, note smoothness of both mechanical and electrical operation.

3.1.2 Visual Inspection

Before performing any tests, visually inspect the 972S-2 test set for any obvious mechanical defects.

3.1.3 Test Setup

Make sure that no power sources are connected to the 972S-2 test set and that the interconnect cables are not plugged into any flight control system component. Ensure that all switches on the 972S-2 test set are in the OFF or down position with the following exceptions:

614E-41 IN/OUT switch (S8) should be set at 913.

590B-3 IAS switch (S6) should be set at 161H.

590A-6 POWER switch (S5) should be set at SYS.

GYRO MON switch (S33) should be set at LCL.

329T-1 ±15 VDC switch (S69) should be set at SVO.

Units with Service Bulletin No 4: 334C-9 913K switch (S85) should be set at -1A.

Ensure that circuit breakers CB1 and CB2 are set in the OFF position. Perform the test procedures in tables 2 and 3.

Table 2. 972S-2 Power and Phasing Test Procedures.

TEST	PROCEDURE	SWITCH/ CONTROL	SWITCH/ CONTROL SETTING	TEST POINTS	DESIRED RESULTS
1.	Power tests ***Warning*** 115 Vac is present on the A2 subassembly and on circuit breaker CB1 starting with step 1.1.				
1.1	Connect the 115-Vac, 400-Hz, single-phase power source to 115 VAC POWER (J201).	115 VAC POWER (CB1)	ON		115 VAC POWER (DS24) lights)
1.2	Measure fuse voltage at center of fuseholder cap.			332D-12 26 VAC fuse (F1) to COM (J117)	26 ±2 Vrms
				913K-1 26 VAC fuse (F2) to COM (J117)	26 ±2 Vrms
				329T-1 26 VAC fuse (F8) to COM (J117)	26 ±2 Vrms
				329A 26 VAC fuse (F7) to COM (J117)	26 ±2 Vrms
				331P 26 VAC fuse (F11) to COM (J117)	26 ±2 Vrms
				SPIN MOTOR CONTROL 115 VAC fuse (F12) to COM (J117)	115 ±3 Vrms
1.3	Connect the 28-Vdc power source to 28 VDC POWER (J202)	28 VDC POWER (CB2)	ON	28V LTG (J120-red) to 28V LTG (J121-black)	28 VDC POWER (DS23) lights +28 ±1 Vdc
1.4	Measure fuse voltage at center of fuseholder cap.			913K-1 28 VDC fuse (F4) to GND (J116)	+28 ±1 Vdc
				161H-1 28 VDC fuse (F3) to GND (J116)	+28 ±1 Vdc
				334D-6 28 VDC fuse (F6) to GND (J116)	+28 ±1 Vdc
				334C-9 28 VDC fuse (F5) to GND (J116)	+28 ±1 Vdc
				329T-1 28 VDC fuse (F9) to GND (J116)	+28 ±1 Vdc
				331P 28 VDC fuse (F10) to GND (J116)	+28 ±1 Vdc

Table 2. 972S-2 Power and Phasing Test Procedures (Cont).

TEST	PROCEDURE	SWITCH/ CONTROL	SWITCH/ CONTROL SETTING	TEST POINTS	DESIRED RESULTS
2.	Phase checks				
2.1	Connect trace A of oscilloscope to test points. Set trace A deflection to 20 volts/division and sweep to 1 millisecond/division.	331P POWER (S73)	ON	331P 26 VAC REF (J104-orange) to 26 VAC REF (J103-black)	Period of 2.5 ±1.5 milliseconds 68 to 85 volts peak to peak
2.2	Connect trace B of oscilloscope to test points. Set trace B deflection to 20 volts/division and sweep to 1 millisecond/division. Observe relationship of trace A and trace B.			332D-12 26 VAC fuse cap (F1) to GND (J116)	In phase
				Autopilot 26 VAC fuse cap (F2) to GND (J116)	In phase
				329T-1 26 VAC fuse cap (F8) to GND (J116)	In phase
				331P 26 VAC fuse cap (F11) to GND (J116)	In phase
2.3 (Cont)	Connect trace B of oscilloscope to test points. Observe relationship of trace A to trace B.	Autopilot PITCH SOURCE (S45)	LCL	Autopilot PITCH (J56-orange) to PITCH (J55-white)	180° out of phase
		Autopilot ROLL-2 SOURCE (S43)	LCL		
		329T-1 ROLL DATA-1 (S67)	LCL		
		331P HDG SEL (S74)	LCL		
		329T-1 ROLL DATA-2 (S68)	SIM		
		Autopilot PITCH (R14)	CCW		
			CW	Autopilot PITCH (J56-orange) to PITCH (J55-white)	In phase
				913K-1 P1-31 to 913K-1 P1-30	In phase
		Autopilot ROLL-2 (R13)	CCW	Autopilot ROLL-2 (J54-orange) to ROLL-2 (J53-white)	180° out of phase
				329T-1 ROLL DATA-2 (J90-orange) to ROLL DATA-2 (J89-white)	180° out of phase

Table 2. 972S-2 Power and Phasing Test Procedures (Cont).

TEST	PROCEDURE	SWITCH/ CONTROL	SWITCH/ CONTROL SETTING	TEST POINTS	DESIRED RESULTS
2.3 (Cont)			CW	Autopilot ROLL-2 (J54-orange) to ROLL-2 (J53-white)	In phase
				329T-1 ROLL DATA-2 (J90-orange) to ROLL DATA-2 (J89-white)	In phase
				913K-1 P1-32 to 913K-1 P1-33	In phase
				329T-1 P1-1 to 329T-1 P1-13	In phase
		329T-1 ROLL DATA-1 (R18)	CCW	329T-1 ROLL DATA-1 (J88-orange) to ROLL DATA-1 (J87-white)	180° out of phase
			CW	329T-1 ROLL DATA-1 (J88-orange) to ROLL DATA-1 (J87-white)	In phase
				329T-1 P1-2 to 329T-1 P1-14	In phase
		331P HDG COURSE (R19)	CCW	331P HDG COURSE SIM (J110-orange) to HDG COURSE SIM (J109-white)	180° out of phase
			CW	331P HDG COURSE SIM (J110-orange) to HDG COURSE SIM (J109-white)	In phase
				913K-1 P1-25 to 913K-1 P1-24	In phase
				913K-1 P1-21 to 913K-1 P1-22	In phase
				161H-1 P1-41 to 161H-1 P1-37	In phase
2.4	Disconnect oscilloscope from 972S-2.	Autopilot PITCH SOURCE (S45) Autopilot ROLL-2 SOURCE (S43) 329T-1 ROLL DATA-1 (S67) 329T-1 ROLL DATA-2 (S68) 331P POWER (S73)	OFF OFF 329A EXT/332D OFF		

Table 3. 972S-2 Functional Area Test Procedures.

TEST	SWITCH/CONTROL	SWITCH/ CONTROL SETTING	TEST POINTS	DESIRED RESULTS
1.	590A-6 tests			
1.1	Power (S5)	LCL	590A-6 P1-A to 590A-6 P1-C	+13 ±1.3 V dc
			POWER IN (J6-red) to PRESS (J3-black)	+13 ±1.3 V dc
			POWER IN (J5-brown) to PRESS (J3-black)	-13 to ±1.3 V dc
			590A-6 P1-B to 590A-6 P1-C	-13 ±1.3 V dc
			590A-6 P1-E, F, D, K to 590A-6 P1-C	0 V dc
			590A-6 P1-H to 590A-6 P1-C	+3.5 ±0.5 V dc
1.2	HOLD (S2)	HOLD	590A-6 P1-H to 590A-6 P1-C	+24 ±1 V dc
1.3	MODE (S1)	913K	590A-6 P1-H to 590A-6 P1-C	0 V dc
1.4	HOLD (S3) ANAV/ALT HOLD (R3)	LCL CW	Autopilot ANAV/ALT HOLD jacks (J31-red to J30-black)	+7.5 ±1.0 V dc
			Autopilot ALT ERROR (J71-red) to ALT ERROR (J70-black)	+7.5 ±1.0 V dc
			161H-1 P1-40 to 161H-1 P1-36	+7.5 ±1.0 V dc
			913K-1 P1-15 to 913K-1 P1-16	+7.5 ±1.0 V dc
1.5	SYS (S4)	161H	913K-1 P1-15 to 913K-1 P1-16	0 V dc
1.6	ANAV/ALT HOLD (R3)	CCW	Autopilot ANAV/ALT HOLD jacks (J31-red to J30-black)	-7.5 ±1.0 V dc
1.7	ANAV/ALT HOLD (S83)	ANAV	913K-1 P1-28 to P1-35	-7.5 ±1.0 V dc
1.8	ANAV/ALT HOLD (S83) POWER (S5) HOLD (S2) MODE (S1) HOLD (S3) SYS (S4)	ALT HOLD SYS SYN LCL SYS 913K		
2.	590B-3 tests			
2.1	IAS (S6)	LCL	+13 (J7) to OUTPUT (J8-black)	+13 ±1.3 V dc
2.2	IAS SIM (R1)	CCW	IAS SIM (J10) to OUTPUT (J8-black)	0 V dc
		CW	IAS SIM (J10) to OUTPUT (J8-black)	+15 ±1 V dc
			161H-1 P1-44 to OUTPUT (J8-black)	+15 ±1 V dc
			590B-3 P1-C to 590B-3 P1-A	+13 ±1.3 V dc
2.3	IAS (S6) IAS SIM (R1)	161H CW	590B-3 P1-C to 590B-3 P1-A	0 V dc

Table 3. 972S-2 Functional Area Test Procedures (Cont).

TEST	SWITCH/CONTROL	SWITCH/ CONTROL SETTING	TEST POINTS	DESIRED RESULTS
3.	614E-41 tests			
3.1	P/R SEL (S7)	UP/DN		UP/DN (DS2) lights
			614E-41 P1-A to COM (J17)	+28 ±1 Vdc
			913K-1 P1-3 to COM (J17)	+28 ±1 Vdc
3.2	P/R SEL (S7)	LT/RT		LT/RT (DS1) lights
			913K-1 P2-22 to COM (J17)	+28 ±1 Vdc
			614E-41 P1-D to COM (J17)	+28 ±1 Vdc
3.3	P/R SEL (S7) IN/OUT (S8)	OFF LCL	614E-41 P1-E to COM (J17)	+13 ±1.3 Vdc
			614E-41 P1-C to COM (J17)	-13 ±1.3 Vdc
			+13 (J19) to COM (J17)	+13 ±1.3 Vdc
			-13 (J18) to COM (J17)	-13 ±1.3 Vdc
3.4	IN/OUT (S8) P/R SEL (S7) P/R CMD (R2)	913 UP/DN CCW	913K-1 P1-18 to GND (J116)	-9.5 ±1.0 Vdc
			P (J13) to COM (J17)	-9.5 ±1.0 Vdc
			P/R CMD (J11) to COM (J17)	-9.5 ±1.0 Vdc
3.5	P/R CMD (R2)	CW	P/R CMD (J11) to COM (J17)	+9.5 ±1.0 Vdc
			P (J13) to COM (J17)	+9.5 ±1.0 Vdc
3.6	P/R SEL (S7)	LT/RT	913K-1 P2-3 to GND (J116)	+9.5 ±1.0 Vdc
			R (J12) to COM (J17)	+9.5 ±1.0 Vdc
3.7	P/R CMD (R2)	CCW	913K-1 P2-3 to GND (J116)	-9.5 ±1.0 Vdc
			R (J12) to COM (J17)	-9.5 ±1.0 Vdc
3.8	P/R SEL (S7)	OFF		
4.	332D-12 tests			
4.1	26 VAC (S10)	ON	332D-12 P1-A to 332D-12 P1-B	26 ±2 Vrms
			332D-12 P1-C, D, E, F, G, H, J, K to 332D-12 P1-B	0 Vrms
4.2	26 VAC (S10)	OFF	PITCH (J14-yellow) to GND (J116)	5.11 kΩ ±1%
			PITCH (J15-white) to GND (J116)	5.11 kΩ ±1%
			PITCH (J16-orange) to GND (J116)	5.11 kΩ ±1%
(Cont)			ROLL (J20-yellow) to GND (J116)	5.11 kΩ ±1%

Table 3. 972S-2 Functional Area Test Procedures (Cont).

TEST	SWITCH/CONTROL	SWITCH/ CONTROL SETTING	TEST POINTS	DESIRED RESULTS
4.2 (Cont)			ROLL (J21-white) to GND (J116)	5.11 kΩ ±1%
			ROLL (J22-orange) to GND (J116)	5.11 kΩ ±1%
5.	Autopilot section tests			
5.1	DSENGA (S21)	Pressed in	913K-1 P2-19 to GND (J116)	0 V dc
		Released	913K-1 P2-19 to GND (J116)	+28 ±1 V dc
5.2	SYNC (S22)	Pressed in	913K-1 P2-21 to GND (J116)	+28 ±1 V dc
		Released	913K-1 P2-21 to GND (J116)	0 V dc
5.3	NAV CAPT (S30)	LCL	913K-1 P2-24 to GND (J116)	+28 ±1 V dc
			NAV CAPT (J34) to GND (J116)	0 V dc
		161H	NAV CAPT (J34) to GND (J116)	10 kΩ ±1%
			913K-1 P2-24 to GND (J116)	10 kΩ ±1%
5.4	TRIM DSENGA (S31)	LCL	913K-1 P2-16 to GND (J116)	+28 ±1 V dc
			TRIM DSENGA (J35) to GND (J116)	+28 ±1 V dc
		334D-6	TRIM DSENGA (J35) to GND (J116)	0 V dc
			913K-1 P2-16 to GND (J116)	0 V dc
5.5	ATTD FLAG (S32)	161H	ATTD FLAG (J36) to GND (J116)	0 V dc
		SYS	ATTD FLAG (J36) to GND (J116)	+28 ±1 V dc
5.6	GYRO MON (S33)	329A	ATTD FLAG (J36) to GND (J116)	0 V dc
		332D	ATTD FLAG (J36) to GND (J116)	0 V dc
		LCL	ATTD FLAG (J36) to GND (J116)	+28 ±1 V dc
5.7	ATTD FLAG (S32)	OFF		
5.8	LOC LOGIC (S20)	+ (plus)	913K-1 P1-27 to GND (J116)	+28 ±1 V dc
			161H-1 P1-2 to GND (J116)	+28 ±1 V dc
		- (minus)	161H-1 P1-2 to GND (J116)	< 2 Ω
			913K-1 P1-27 to GND (J116)	< 2 Ω
5.9	RADIO ALT MON (S19)	ON	913K-1 P1-6 to GND (J116)	+28 ±1 V dc
			161H-1 P1-3 to GND (J116)	+28 ±1 V dc
		OFF	161H-1 P1-3 to GND (J116)	< 2 Ω
			913K-1 P1-6 to GND (J116)	< 2 Ω
5.10 (Cont)	ANAV MON (S18)	ON	913K-1 P2-32 to GND (J116)	+28 ±1 V dc
			161H-1 P1-14 to GND (J116)	+28 ±1 V dc

Table 3. 972S-2 Functional Area Test Procedures (Cont).

TEST	SWITCH/CONTROL	SWITCH/ CONTROL SETTINGS	TEST POINTS	DESIRED RESULTS
5.10 (Cont)		OFF	161H-1 P1-14 to GND (J116)	< 2 Ω
			913K-1 P2-32 to GND (J116)	< 2 Ω
5.11	TRACK (S27)	LCL (ON)	161H-1 P1-21 to GND (J116)	+28 ±1 V dc
			TRACK (J29) to GND (J116)	+28 ±1 V dc
		913K (OFF)	TRACK (J29) to GND (J116)	0 V dc, 10 kΩ ±1%
			161H-1 P1-21 to GND (J116)	0 V dc, 10 kΩ ±1%
5.12	DME FLAG (S26)	28V	161H-1 P1-26 to GND (J116)	+28 ±1 V dc
		7V	161H-1 P1-26 to GND (J116)	7 ±1 V dc
		OFF	161H-1 P1-26 to GND (J116)	0 V dc
5.13	SELF TEST (S17)	LCL	161H-1 P1-43 to GND (J116)	+28 ±1 V dc
		OFF	161H-1 P1-43 to GND (J116)	0 V dc
5.14	HDG MODE (S16)	LCL	161H-1 P1-35 to GND (J116)	+28 ±1 V dc
			HDG MODE (J28) to GND (J116)	+28 ±1 V dc
		OFF	HDG MODE (J28) to GND (J116)	0 V dc, 10 kΩ ±1%
			161H-1 P1-35 to GND (J116)	0 V dc, 10 kΩ ±1%
5.15	APPR MODE (S14)	LCL	161H-1 P1-10 to GND (J116)	+28 ±1 V dc
			APPR MODE (J26) to GND (J116)	+28 ±1 V dc
		913K	APPR MODE (J26) to GND (J116)	0 V dc, 10 kΩ ±1%
			161H-1 P1-10 to GND (J116)	0 V dc, 10 kΩ ±1%
5.16	IAS MODE (S12)	LCL	161H-1 P1-47 to GND (J116)	+28 ±1 V dc
			IAS MODE (J24) to GND (J116)	+28 ±1 V dc
		913K	IAS MODE (J24) to GND (J116)	0 V dc, 10 kΩ ±1%
			161H-1 P1-47 to GND (J116)	0 V dc, 10 kΩ ±1%
5.17	ALT MODE (S11)	LCL	161H-1 P1-57 to GND (J116)	+28 ±1 V dc
			ALT MODE (J23) to GND (J116)	+28 ±1 V dc
		913K	ALT MODE (J23) to GND (J116)	0 V dc, 10 kΩ ±1%
			161H-1 P1-57 to GND (J116)	0 V dc, 10 kΩ ±1%
5.18	BC MODE (S13)	LCL	161H-1 P1-53 to GND (J116)	+28 ±1 V dc
			BC MODE (J25) to GND (J116)	+28 ±1 V dc
		913K	BC MODE (J25) to GND (J116)	0 V dc, 10 kΩ ±1%
			161H-1 P1-53 to GND (J116)	0 V dc, 10 kΩ ±1%

Table 3. 972S-2 Functional Area Test Procedures (Cont).

TEST	SWITCH/CONTROL	SWITCH/ CONTROL SETTING	TEST POINTS	DESIRED RESULTS
5.19	NAV MODE (S15)	LCL	NAV MODE (J27) to GND (J116)	+28 ±1 V dc
			161H-1 P1-50 to GND (J116)	+28 ±1 V dc
		913K	161H-1 P1-50 to GND (J116)	0 V dc, 10 kΩ ±1%
			NAV MODE (J27) to GND (J116)	0 V dc, 10 kΩ ±1%
5.20	913K POWER (S34) 331P HDG SEL (S74)	ON EXT	913K-1 P1-29 to 913K-1 P1-26	26 ±2 V rms
			913K-1 P1-23 to 913K-1 P1-26	+28 ±1 V dc
5.21	913K POWER (S34) 161H POWER (S25)	OFF ON	161H-1 P1-5 to 161H-1 P1-33	+28 ±1 V dc
	161H POWER (S25) 331P HDG SEL (S74)	OFF LCL		
5.22	Connect jumper from 28 V LTG (J120-red) to 913K-1 P2-35			GO AROUND ARM (DS18) lights
			913K-1 P2-27 to GND (J116)	0 V dc
5.23	GA (S23)	Pressed in	913K-1 P2-27 to GND (J116)	+28 ±1 V dc
	GA (S23) Remove jumper from 28V LTG (J120-red) and 913K-1 P2-35.	Released		
5.24	334D-6 ENGAGE (S53) MDL MKR (S24)	LCL DC	913K-1 P1-12 to GND (J116)	+5.0 ±0.5 V dc
5.25	MDL MKR (S24)	AC	913K-1 P1-12 to GND (J116)	+5.0 ±0.5 V rms
	MDL MKR (S24)	OFF		
5.26	FLAG (R4)	CCW	FLAG (J33-red) to FLAG (J32-black)	0 V dc
		CW	FLAG (J33-red) to FLAG (J32-black)	+0.65 ±0.1 V dc
5.27	GS FLAG (S29)	ON	913K-1 P1-1 to 913K-1 P1-2	+0.65 ±0.1 V dc
5.28	NAV FLAG (S28)	OFF	161H-1 P1-30 to 161H-1 P1-34	0 V dc
		FXD	161H-1 P1-30 to 161H-1 P1-34	+0.65 ±0.1 V dc
		VAR		
	FLAG (R4)	CCW	161H-1 P1-30 to 161H-1 P1-34	0 V dc
		CW	161H-1 P1-30 to 161H-1 P1-34	+0.65 ±0.1 V dc
	NAV FLAG (S28)	OFF		
	GS FLAG (S29)	OFF		
5.29	DME SIG (S35) DME SIG (R5)	ON CCW	DME SIG (J38-red) to DME SIG (J37-black)	0 V dc
5.30	DME SIG (R5)	CW	DME SIG (J38-red) to DME SIG (J37-black)	+10.0 ±0.5 V dc
			161H-1 P1-13 to 161H-1 P1-9	+10.0 ±0.5 V dc
	DME SIG (S35)	OFF		
5.31	RADIO ALTITUDE (S36) RADIO ALTITUDE (R6)	ON CCW	RADIO ALTITUDE (J40-red) to RADIO ALTITUDE (J39-black)	0 V dc
			161H-1 P1-15 to 161H-1 P1-16	0 V dc

Table 3. 972S-2 Functional Area Test Procedures (Cont).

TEST	SWITCH/CONTROL	SWITCH CONTROL SETTING	TEST POINTS	DESIRED RESULTS
5.32	RADIO ALTITUDE (R6)	CW	RADIO ALTITUDE (J40-red) to RADIO ALTITUDE (J39-black)	+28 ±1 V dc
			161H-1 P1-15 to 161H-1 P1-16	+28 ±1 V dc
	RADIO ALTITUDE (S36)	OFF		
5.33	VOR/LOC DEV (S41) VOR/LOC DEV (R11)	161H CCW	VOR/LOC DEV (J50-red) to VOR/LOC DEV (J49-black)	-650 ±100 mV dc
			161H-1 P1-38 to 161H-1 P1-42	-650 ±100 mV dc
5.34	VOR/LOC DEV (R11)	CW	VOR/LOC DEV (J50-red) to VOR/LOC DEV (J49-black)	+650 ±100 mV dc
5.35	VOR/LOC DEV (S41)	913K	913K-1 P2-9 to 913K-1 P2-10	+650 ±100 mV dc
5.36	GS DEV (S40) GS DEV (R10)	913K CCW	GS DEV (J48-red) to GS DEV (J47-black)	-650 ±100 mV dc
5.37	GS DEV (R10)	CW	GS DEV (J48-red) to GS DEV (J47-black)	+650 ±100 mV dc
			913K-1 P1-13 to 913K-1 P1-14	+650 ±100 mV dc
			161H-1 P1-7 to 161H-1 P1-11	0 V dc
5.38	GS DEV (S40)	161H	161H-1 P1-7 to 161H-1 P1-11	+650 ±100 mV dc
5.39	SERVO FORCE (R12) SERVO FORCE (S42)	CCW LCL	SERVO FORCE (J52-red) to SERVO FORCE (J51-black)	-28 ±1 V dc
			913K-1 P2-11 to 913K-1 P2-12	-28 ±1 V dc
			329T-1 FORCE (J86-red) to FORCE (J85-black)	-28 ±1 V dc

Table 3. 972S-2 Functional Area Test Procedures (Cont).

TEST	SWITCH/CONTROL	SWITCH/ CONTROL SETTING	TEST POINTS	DESIRED RESULTS
5.40	SERVO FORCE (R12)	CW	329T-1 FORCE (J86-red) to FORCE (J85-black)	+28 ±1 Vdc
			329T-1 P1-7 to 329T-1 P1-19	+28 ±1 Vdc
5.41	SERVO FORCE (S42) AILERON SERVO CMD (S39)	SVO 913K	AILERON SERVO CMD (J46-red) to AILERON SERVO CMD (J45-black)	0 Vdc
5.42	AILERON SERVO CMD (R9) AILERON SERVO CMD (S42)	CCW LCL	AILERON SERVO CMD (J46-red) to AILERON SERVO CMD (J45-black)	-10 ±1 Vdc
5.43	AILERON SERVO CMD (R9)	CW	AILERON SERVO CMD (J46-red) to AILERON SERVO CMD (J45-black)	+10 ±1 Vdc
			161H-1 P1-48 to 161H-1 P1-52	+10 ±1 Vdc
5.44	ELEV SERVO CMD (S38)	913K	ELEV SERVO CMD (J44-red) to ELEV SERVO CMD (J43-black)	0 Vdc
5.45	ELEV SERVO CMD (S38) ELEV SERVO CMD (R8)	LCL CCW	ELEV SERVO CMD (J44-red) to ELEV SERVO CMD (J43-black)	-10 ±1 Vdc
5.46	ELEV SERVO CMD (R8)	CW	ELEV SERVO CMD (J44-red) to ELEV SERVO CMD (J43-black)	+10 ±1 Vdc
			161H-1 P1-32 to 161H-1 P1-28	+10 ±1 Vdc
5.47	RUDDER SERVO CMD (S37)	329T	RUDDER SERVO CMD (J42-red) to RUDDER SERVO CMD (J41-black)	0 Vdc
5.48	RUDDER SERVO CMD (S37) RUDDER SERVO CMD (R7)	LCL CCW	RUDDER SERVO CMD (J42-red) to RUDDER SERVO CMD (J41-black)	-10 ±1 Vdc
5.49	RUDDER SERVO CMD (R7)	CW	RUDDER SERVO CMD (J42-red) to RUDDER SERVO CMD (J41-black)	+10 ±1 Vdc
			161H-1 P1-24 to 161H-1 P1-20	+10 ±1 Vdc
5.50	PITCH SOURCE (S45) PITCH (R14)	LCL CW	PITCH (J56-orange) to PITCH (J55-white)	12.0 ±1.0 Vrms
			913K-1 P1-31 to 913K-1 P1-30	12.0 ±1.0 Vrms
	PITCH (R14) PITCH SOURCE (S45)	CCW OFF	PITCH (J56-orange) to PITCH (J55-white)	0 Vrms
5.51	ROLL-2 SOURCE (S43) 329T-1 ROLL DATA-2 (S68) ROLL-2 (R13)	LCL SIM CW	ROLL-2 (J54-orange) to ROLL-2 (J53-white)	12.0 ±1.0 Vrms
			913K-1 P1-32 to 913K-1 P1-33	12.0 ±1.0 Vrms
			329T-1 ROLL DATA-2 (J90-orange) to ROLL DATA-2 (J89-white)	12.0 ±1.0 Vrms

Table 3. 972S-2 Functional Area Test Procedures (Cont).

TEST	SWITCH/CONTROL	SWITCH/ CONTROL SETTING	TEST POINTS	DESIRED RESULTS
5.52	ROLL-2 (R13) ROLL-2 SOURCE (S43) 329T-1 ROLL DATA-2 (S68)	CCW OFF EXT/332D	ROLL-2 (J54-orange) to ROLL-2 (J53-white)	0 Vrms
			ROLL DATA-2 (J90-orange) to ROLL DATA-2 (J89-white)	0 Vrms
			329T-1 P1-1 to 329T-1 P1-13	0 Vrms
			COM 1 (J58) to GND (J116)	> 100 kΩ
			V/L DEV 913K (J59) to COM 2 (J57)	10 kΩ ±1%
			GS DEV 913K (J60) to COM 2 (J57)	10 kΩ ±1%
			TO INSTR (J68-black) to TO INSTR (J69-red)	5 kΩ ±1%
			161H CMD OUTPUTS-RUD (J79) to COM 2 (J57)	19.6 kΩ ±1%
			161H CMD OUTPUTS-ELEV (J80) to COM 2 (J57)	19.6 kΩ ±1%
			161H CMD OUTPUTS-AIL (J81) to COM 2 (J57)	19.6 kΩ ±1%
			OUT OF VIEW (J78) to GND (J116)	10 kΩ ±1%
5.53 (with SB 4)	913K DIM (S84) 913K (S85) (334C-9 section)	HI -1A	913K-1 P1-11 to GND (J116)	0 V dc
	913K (S85)	-002	913K-1 P1-11 to GND (J116)	+28 ±1 V dc
	913K DIM (S84)	LO	913K-1 P1-11 to GND (J116)	+7 ±1 V dc
	913K DIM (S84)	OFF	913K-1 P1-11 to GND (J116)	0 V dc
	913K (S85)	-1A		
6.	334C-9 tests (Deleted. This portion of the 972S-2 has been replaced by the 972S-3 Servo Test Set.)			

Table 3. 972S-2 Functional Area Test Procedures (Cont).

TEST	SWITCH/CONTROL	SWITCH/ CONTROL SETTING	TEST POINTS	DESIRED RESULTS
7.	334D-6 tests			
7.1	MNL TRIM (S59)	UP	334D-6 P1-E to 334D-6 P1-H	+28 ±1 Vdc
		DN	334D-6 P1-G to 334D-6 P1-D	+28 ±1 Vdc
7.2	MNL TRIM (S59) AP TRIM LOCAL (S60) AP TRIM SELECT (S61)	OFF UP LCL	334D-6 P1-C to 334D-6 P1-B	+28 ±1 Vdc
			AP TRIM UP (J75-red) to AP TRIM UP (J74-black)	+28 ±1 Vdc
7.3	AP TRIM LOCAL (S60)	DN	334D-6 P1-F to 334D-6 P1-A	+28 ±1 Vdc
			AP TRIM DN (J73-red) to AP TRIM DN (J72-black)	+28 ±1 Vdc
7.4	AP TRIM LOCAL (S60) POWER (S62)	OFF ON	334D-6 P1-M to 334D-6 P1-L	+28 ±1 Vdc
7.5	LCL ENGA (S58)	NORM	334D-6 P1-K to COM (J117)	+28 ±1 Vdc
			334D-6 P1-J to COM (J117)	0 Vdc
		LO	334D-6 P1-J to COM (J117)	+28 ±1 Vdc
			334D-6 P1-K to COM (J117)	0 Vdc
7.6	POWER (S62) LCL ENGA (S58)	OFF OFF		
8.	329A-4/4V tests			
8.1	POWER (S63)	ON	329A P1-C to 329A P1-F	26 ±2 Vrms
			329A P2-B to GND (J116)	+28 ±1 Vdc
8.2	IND (S64)	913K	All pins on 329A P2 referenced to GND (J116)	0 Vdc
8.3	POWER (S63) STR FLAG (S65)	OFF IN	STR FLAG (J82) to COM (J117)	0 Vdc
8.4	IND (S64)	LCL	STR FLAG (J82) to COM (J117)	+28 ±1 Vdc
8.5	STR FLAG (S65)	OUT	STR FLAG (J82) to COM (J117)	+28 ±1 Vdc
8.6	COMMAND BAR PITCH (R17)	CCW	COMMAND BAR PITCH (J98) to COM (J97)	-9.5 ±1.0 Vdc
		CW	COMMAND BAR PITCH (J98) to COM (J97)	+9.5 ±1.0 Vdc
			329A P2-D to 329A P2-C	+9.5 ±1.0 Vdc

Table 3. 972S-2 Functional Area Test Procedures (Cont).

TEST	SWITCH/CONTROL	SWITCH/ CONTROL SETTING	TEST POINTS	DESIRED RESULTS
8.7	COMMAND BAR ROLL (R16)	CW	329A P2-H to 329A P2-C	-9.5 ±1.0 Vdc
		CCW	329A P2-H to 329A P2-C	+9.5 ±1.0 Vdc
			COMMAND BAR ROLL (J96) to COM (J97)	-9.5 ±1.0 Vdc
8.8	IND (S64)	913K	COMMAND BAR ROLL (J96) to COM (J97)	0 Vdc
			COMMAND BAR PITCH (J98) to COM (J97)	0 Vdc
8.9	IND (S64) STR FLAG (S65) ATTD (S66)	LCL IN LCL	PITCH (J95-orange) to GND (J116)	5 kΩ ±1%
			PITCH (J94-white) to GND (J116)	5 kΩ ±1%
			ROLL (J102-orange) to GND (J116)	5 kΩ ±1%
			ROLL (J101-white) to GND (J116)	5 kΩ ±1%
9.	329T-1 tests			
9.1	POWER (S72)	ON	329T-1 P1-11 to 329T-1 P1-23	26 ±2 Vrms
			329T-1 P1-10 to 329T-1 P1-23	+28 ±1 Vdc
9.2	Autopilot SERVO FORCE (S42)	SVO	All pins on 329T-1 P1 except 10 and 11 referenced to 329T-1 P1-23	0 Vdc
9.3	Autopilot SERVO FORCE (S42) POWER (S72) ROLL DATA-2 (S68) Autopilot ROLL-2 (R13)	LCL OFF SIM CW	ROLL DATA-2 (J90-orange) to ROLL DATA-2 (J89-white)	12.5 ±1.0 Vrms
9.4	ROLL DATA-2 (S68)	EXT/332D	329T-1 P1-1 to 329T-1 P1-13	0 Vrms
9.5	ROLL DATA-1 (S67) ROLL-1 (R18)	LCL CW	ROLL DATA-1 (J88-orange) to ROLL DATA-1 (J87-white)	12.5 ±1.0 Vrms
9.6	ROLL DATA-1 (S67)	329A	329T-1 P1-2 to 329T-1 P1-14	0 Vrms
9.7	±15 VDC SOURCE (S69)	LCL	±15 VDC SOURCE (J91-brown) to GND (J116)	-15 ±1 Vdc
			±15 VDC SOURCE (J92-red) to GND (J116)	+15 ±1 Vdc
9.8	±15 VDC SOURCE (S69) TRIM OUT (S70)	SVO LCL	TRIM OUT (J93) to GND (J116)	10 kΩ ±1%
9.9	HI-PASS (S71)	DSB	329T-1 P1-5 to 329T-1 P1-17	<2 Ω
		NORM	329T-1 P1-5 to 329T-1 P1-17	>100 kΩ
(Cont)			ROLL TP (J100) to 329T-1 P1-3	<2 Ω

Table 3. 972S-2 Functional Area Test Procedures (Cont).

TEST	SWITCH/CONTROL	SWITCH/ CONTROL SETTING	TEST POINTS	DESIRED RESULTS
9.9 (Cont)			YAW RATE (J84-red) to YAW RATE (J83-black)	10 kΩ ±1%
			MON (J99) to GND (J116)	5 kΩ ±1%
10.	331P-1 tests			
10.1	POWER (S73)	ON	331P P1-K to 331P P1-C	+28 ±1 Vdc
			331P P1-B to 331P P1-L	26 ±2 Vrms
			331P P2-D to 331P P2-E	26 ±2 Vrms
			26 VAC REF (J104-orange) to 26 VAC REF (J103-black)	26 ±2 Vrms
10.2	POWER (S73) HDG SEL (S74) HDG COURSE SIM (R19)	OFF LCL CW	HDG COURSE SIM (J110-orange) to HDG COURSE SIM (J109-white)	28 ±2 Vrms
10.3	HDG SEL (S74)	EXT	161H-1 P1-41 to 161H-1 P1-37	0 Vrms
10.4	HDG SEL (S74) HDG LOAD (S75)	LCL LCL	HEADING (J107-white) to GND (J116)	5 kΩ ±1%
			HEADING (J108-orange) to GND (J116)	5 kΩ ±1%
			HEADING (J115-yellow) to GND (J116)	5 kΩ ±1%
			STATOR (J105-white) to GND (J116)	5 kΩ ±1%
			STATOR (J106-orange) to GND (J116)	5 kΩ ±1%
			STATOR (J114-yellow) to GND (J116)	5 kΩ ±1%
			FLUX DET OUT (J112-black) to 323A-5 P1-E	< 2 Ω
			FLUX DET OUT (J113-red) to 323A-5 P1-B	< 2 Ω
			FLUX DET IN (J111) to 323A-5 P1-A	< 2 Ω
10.5	SLAVE IND 327C-3 (S76)	LCL	SLAVE IND (J123-red) to SLAVE IND (J122-black)	49.9 kΩ ±1%

Table 3. 972S-2 Functional Area Test Procedures (Cont).

TEST	SWITCH/CONTROL	SWITCH/ CONTROL SETTING	TEST POINTS	DESIRED RESULTS
11.	Ramp generator tests			
11.1	Connect oscilloscope to test points. Set scope deflection to 1 volt/division and sweep to 1 second/division. Connect external scope trigger (+) to RAMP TRIG (J127-blue). ON/OFF (S81) VOLTS/SEC (S82) Autopilot PITCH SOURCE (S45) Autopilot ROLL-2 SOURCE (S43)	 OFF 1 OFF OFF	RAMP (J125-red) to RAMP (J124-black)	
11.2	ON/OFF (S81)	ON		1 volt/second linear ramp for 10 seconds
			Note If ramp waveform does not have the correct slope, adjust by rotating ADJUST (R22). A CW adjustment reduces the slope and a CCW adjustment increases the slope. To generate a new ramp, operate ON/OFF (S81) from ON to OFF to ON.	
11.3	ON/OFF (S81) Set scope deflection to 5 volts/ division and sweep to 0.5 second/division. VOLTS/SEC (S82)	OFF 10		
11.4	ON/OFF (S81)	ON		10 volts/second linear ramp
11.5	ON/OFF (S81) Set scope deflection to 0.1 volt/division and sweep to 1 second/division. VOLTS/SEC (S82)	OFF .1		
11.6	ON/OFF (S81)	ON		0.1 volt/second linear ramp

Table 3. 972S-2 Functional Area Test Procedures (Cont).

TEST	SWITCH/CONTROL	SWITCH/ CONTROL SETTING	TEST POINTS	DESIRED RESULTS
11.7	ON/OFF (S81) Connect oscilloscope to test points. Connect external scope trigger (+) to RAMP TRIG (J127-blue). PITCH/ROLL (S80) Autopilot PITCH SOURCE (S45) Autopilot PITCH DATA (S46) 332D-12 P/R (S9)	OFF PITCH EXT 332D SYS	Autopilot PITCH (J56-orange) to PITCH (J55-white)	
11.8	ON/OFF (S81)	ON		0.1 volt/second linear ramp
11.9	ON/OFF (S81)	OFF	332D-12 PITCH (J16-orange) to PITCH (J15-white)	
11.10	ON/OFF (S81)	ON		0.1 volt/second linear ramp
11.11	ON/OFF (S81) Connect oscilloscope to test points. Connect external scope trigger (+) to RAMP TRIG (J127-blue). PITCH/ROLL (S80) Autopilot ROLL-2 SOURCE (S43) Autopilot ROLL-2 DATA (S44)	OFF ROLL EXT 332D	Autopilot ROLL-2 (J54-orange) to ROLL-2 (J53-white)	
11.12	ON/OFF (S81)	ON		0.1 volt/second linear ramp
11.13	ON/OFF (S81)	OFF	332D-12 ROLL (J22-orange) to ROLL (J21-white)	
11.14	ON/OFF (S81)	ON		0.1 volt/second linear ramp
11.15	Disconnect oscilloscope from 972S-2. ON/OFF (S81) PITCH/ROLL (S80) VOLTS/SEC (S82) Autopilot PITCH SOURCE (S45) Autopilot PITCH DATA (S46) 332D-12 P/R (S9) Autopilot ROLL-2 SOURCE (S43) Autopilot ROLL-2 DATA (S44)	 OFF OFF OFF OFF 329A LCL OFF 329A		

Table 3. 972S-2 Functional Area Test Procedures (Cont).

TEST	SWITCH/CONTROL	SWITCH/ CONTROL SETTING	TEST POINTS	DESIRED RESULTS
12.	Spin motor control tests			
12.1			Left MON (J119) to COM (J117)	0 Vrms
12.2	POWER (S79) MOTOR VOLT (S77)	NORM NORM	Left MON (J119) to COM (J117)	0 Vrms
			331P P3-D to 331P P3-C	115 ±3 Vrms
			331P P3-A, B, and E to 331P P3-C	0 Vrms
			329A P1-H to 329A P1-F	115 ±3 Vrms
			329A P1-A, C, D, E, K, J, to 329A P1-F	0 Vrms
12.3	POWER (S79) MOTOR ADJUST (R20)	MON CCW	Right MON (J118) to COM (J117)	85 ±5 Vrms
			Left MON (J119) to COM (J117)	85 ±5 Vrms
12.4	MOTOR ADJUST (R20)	CW	Right MON (J118) to COM (J117)	115 ±3 Vrms
			Left MON (J119) to COM (J117)	115 ±3 Vrms
12.5	VAR OUT (S78)	329A	329A P1-H to 329A P1-F	0 Vrms
12.6	MOTOR VOLT (S77)	VAR	329A P1-H to 329A P1-F	115 ±3 Vrms
			331P P3-D to 331P P3-C	0 Vrms
12.7	VAR OUT (S78)	331P	331P P3-D to 331P P3-C	115 ±3 Vrms
			329A P1-H to 329A P1-F	0 Vrms
12.8	VAR OUT (S78) MOTOR VOLT (S77) POWER (S79)	329A NORM OFF	Left MON (J119) to right MON (J118)	10 Ω ±1%
13.	Lamp tests			
13.1	Grounded lamps: connect jumper from 28V LTG (J120-red) to test point.		334D-6 P1-P	TRIM MOTION (DS21) lights
			334D-6 P1-N	ENGAGE (DS19) lights
			334D-6 P1-S	AP DSENGA (DS20) lights
			332D-12 P1-K	GYRO (DS3) lights
			329A P1-K	GYRO MON (DS22) lights
			913K-1 P2-17	RUD ENGAGE (DS15) lights
			913K-1 P2-18	PRIM ENGAGE (DS16) lights

Table 3. 972S-2 Functional Area Test Procedures (Cont).

TEST	SWITCH/CONTROL	SWITCH/ CONTROL SETTING	TEST POINTS	DESIRED RESULTS
13.2	Ungrounded lamps: Remove jumper from J120. Connect jumper from 28V LTG (J121-black) to test point.		913K-1 P1-9	GLIDESLOPE ARM (DS14) lights
			913K-1 P1-10	GLIDESLOPE CAPT (DS13) lights
			913K-1 P2-30	GO AROUND ANNUN (DS17) lights
			161H-1 P1-6	LIN DEVN (DS25) lights
			161H-1 P1-12	NAV MODE (DS9) lights
			161H-1 P1-19	HDG MODE (DS10) lights
			161H-1 P1-25	DR (DS4) lights
			161H-1 P1-27	IAS MODE (DS6) lights
			161H-1 P1-45	BC MODE (DS7) lights
			161H-1 P1-46	NAV CAPT (DS11) lights
			913K-1 P1-19	NAV CAPT (DS11) lights
			161H-1 P1-49	APPR MODE (DS8) lights
			161H-1 P1-54	NAV ARM (DS12) lights
			913K-1 P1-11	NAV ARM (DS12) lights
			161H-1 P1-55	ATL MODE (DS5) lights
			913K-1 P2-7	ATL MODE (DS5) lights
			913K-1 P1-34	ENGAGE (DS26) lights
13.3	Remove jumper from J121. Connect jumper from 28V LTG (J120-red) to test point. Autopilot ATTD FLAG (S32) Autopilot GYRO MON (S33)	 SYS 332D-12	Autopilot ATTD/FLAG (J36)	332D-12 GYRO MON (DS3) lights
13.4	Autopilot GYRO MON (S33)	329A	Autopilot ATTD/FLAG (J36)	329A GYRO MON (DS22) lights
	Remove jumper from J120. Autopilot ATTD FLAG (S32) Autopilot GYRO MON (S33)	 OFF 332D-12		

SCHEMATIC CHANGES

REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
A1 (Sheets 1, 2, 3, 4)	Changed R1, R5, R13, R14, R18, and R19 from single-turn to 10-turn potentiometers to improve signal resolution.	1	Serno 15
A2 (Sheet 5)	Removed R40 from S55-4 and S55-1 to permit proper interface with 334C-9 Servo Adapter.	1	Serno 15
A3 (Sheets 5, 6)	Added wire from 334C-9 P1-F (sheet 5) to T1-2 (sheet 6) to supply 26 V ac to the 972S-3 Servo Test Set.	1	Serno 15
B1 (Sheet 1)	Added annunciator DS25 for an indication of linear deviation mode in the 161H-1.	2	Serno 17
B2 (Sheet 1)	Added test jack J126 between 161H-1 P1-25 and DS4 to permit timing of the dead reckoning signal with an oscilloscope.	2	Serno 17
B3 (Sheet 1)	Added resistor voltage divider R47 and R48, and changed the DME FLAG switch S26 to a spdt ON-OFF-ON switch to provide a +28-V flag, no flag or +7-V flag to the 161H-1.	2	Serno 17
B4 (Sheet 1)	Added switch S83, dpdt (ON-NONE-ON), to provide both altitude hold and ANAV signals to the 161H-1. Changed the nomenclature of TRACK S27 from ON/OFF to LCL/913K.	2	Serno 17

972S-2 Autopilot Bench Test Set, Schematic Diagram
Figure 3 (Sheet A)

SCHEMATIC CHANGES

REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
B5 (Sheet 2)	Changed switch S28 to a sp3t switch and connected to both the 913K-1 and the 161H-1 to provide fixed +1.5 V dc, variable 0 to +1.5 V dc, and an OFF flag condition (short). Changed A2R55 from 9090 to 4420 Ω.	2	Serno 17
C1 (Sheet 4)	Changed switch S33 to a sp3t, and connected ALT FLAG + from 161H-1 P1-56 to S33-2. Also connected PROC ATT FLAG + from 161H-1 P1-59 to S32-3 to provide altitude flag inputs from 329A, 332D, and local +20 V dc.	3	Serno 33
C2, C3, C4 (Sheet 2)	Removed resistors A2R42 and A2R43. Changed resistors A2R27 and A2R28 from 196 to 249 Ω. Changed resistors A2R50 and A2R51 from 511 to 249 Ω. Moved resistor A2R29 from the differential input of aileron cmd to the differential input of ELEV CMD. Changes made to meet the requirements of SB 6 for the 161H-1.	3	Serno 33
D1 (Sheet 1)	Added switch S84 (913K DIM) to provide external annunciator dimmer signal to 913K-1 with CPN 622-0966-002.	4	Optional
D2 (Sheet 6)	Added +5 V DC INPUT POWER jacks J203 and J204, and connection to 913K-1 P2-29 to provide +5 V dc panel lighting power to 913K-1 with CPN 622-0966-002.	4	Optional
E1 (Sheet 1)	Added wire between 913K-1 P1-19 (NAV CAPT ANNUN) and NAV CAPT annunciator DS11.	5	Serno 50

972S-2 Autopilot Bench Test Set, Schematic Diagram
Figure 3 (Sheet B)

SCHEMATIC CHANGES

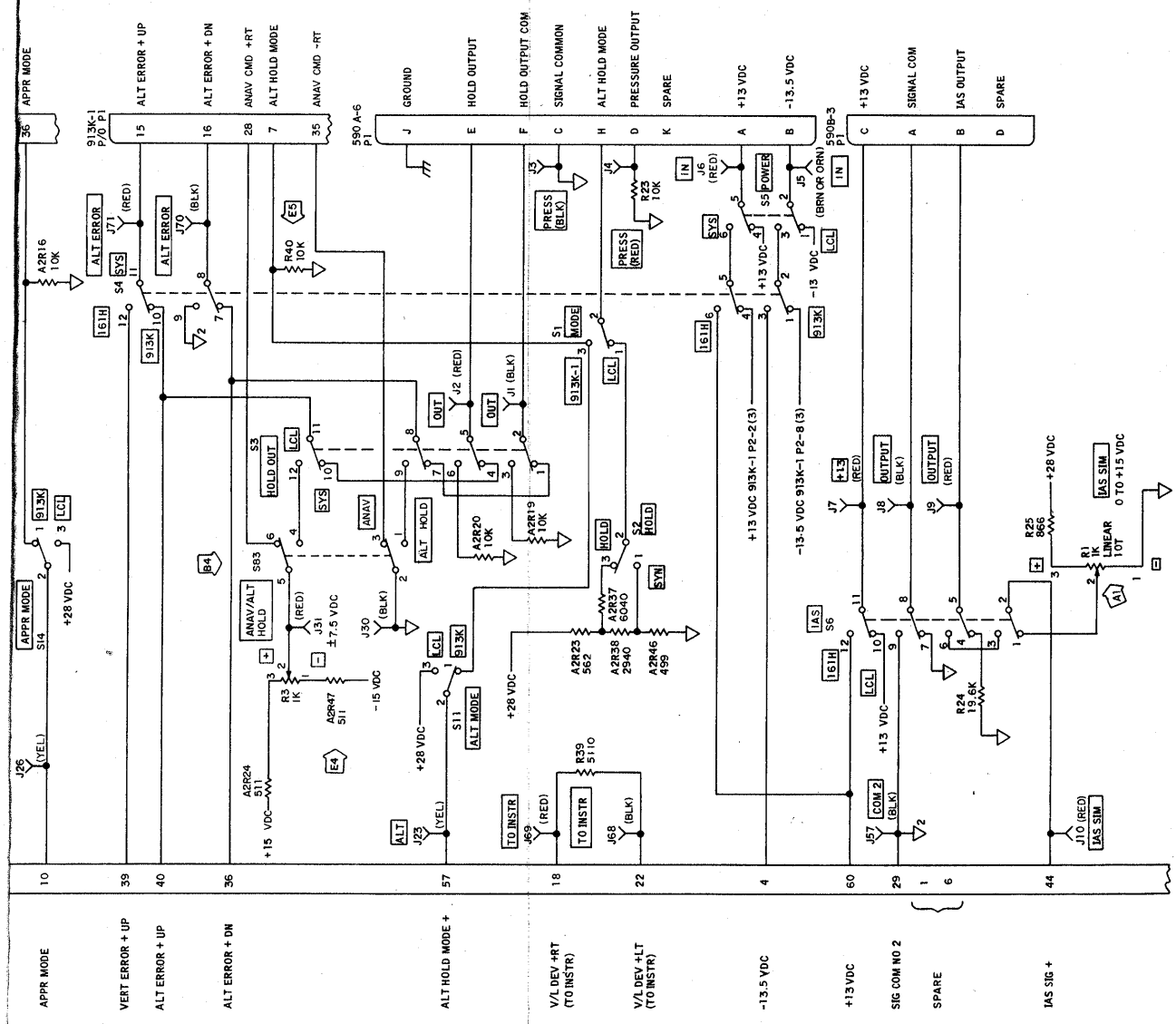
REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
E2 (Sheet 1)	Added wire between 913K-1 P2-7 (ALT ANNUN) and ALT MODE annunciator DS5.	5	Serno 50
E3 (Sheet 1)	Units without SB 4: Added wire between 913K-1 P1-11 (NAV ARM ANNUN) and NAV ARM annunciator DS12. Units with SB 4: Added switch S85 and resistor R53 to select either EXT ANNUN DIM switch S84 or NAV ARM annunciator DS12.	5	Serno 50
E4 (Sheet 1)	Rewired ANAV/ALT HOLD test circuit to eliminate +14 V dc offset voltage.	5	Serno 50
E5 (Sheet 1)	Added resistor R40 (10 kΩ) to load ALT HOLD MODE signal from 913K-1 P1-7.	5	Serno 50
E6 (Sheet 2)	Added diodes A2CR15 and A2CR16 to stabilize VOR/LOC DEV signal.	5	Serno 50
E7 (Sheet 2)	Added diodes A2CR13 and A2CR14 to stabilize GS DEV signal.	5	Serno 50
E8 (Sheet 2)	Added diode A2CR17, changed A2R55 from 470 Ω to 2700 Ω and changed R4 to a 10-turn potentiometer to better regulate FLAG signal.	5	Serno 50
E9 (Sheet 2)	Rewired ELEV CMD signal circuit to eliminate +14 V dc offset voltage.	5	Serno 50
E10 (Sheet 2)	Removed A2R30, A2R45, and A2R53, and disconnected R15, which are no longer required for testing the primary servos.	5	Serno 50

972S-2 Autopilot Bench Test Set, Schematic Diagram
Figure 3 (Sheet C)

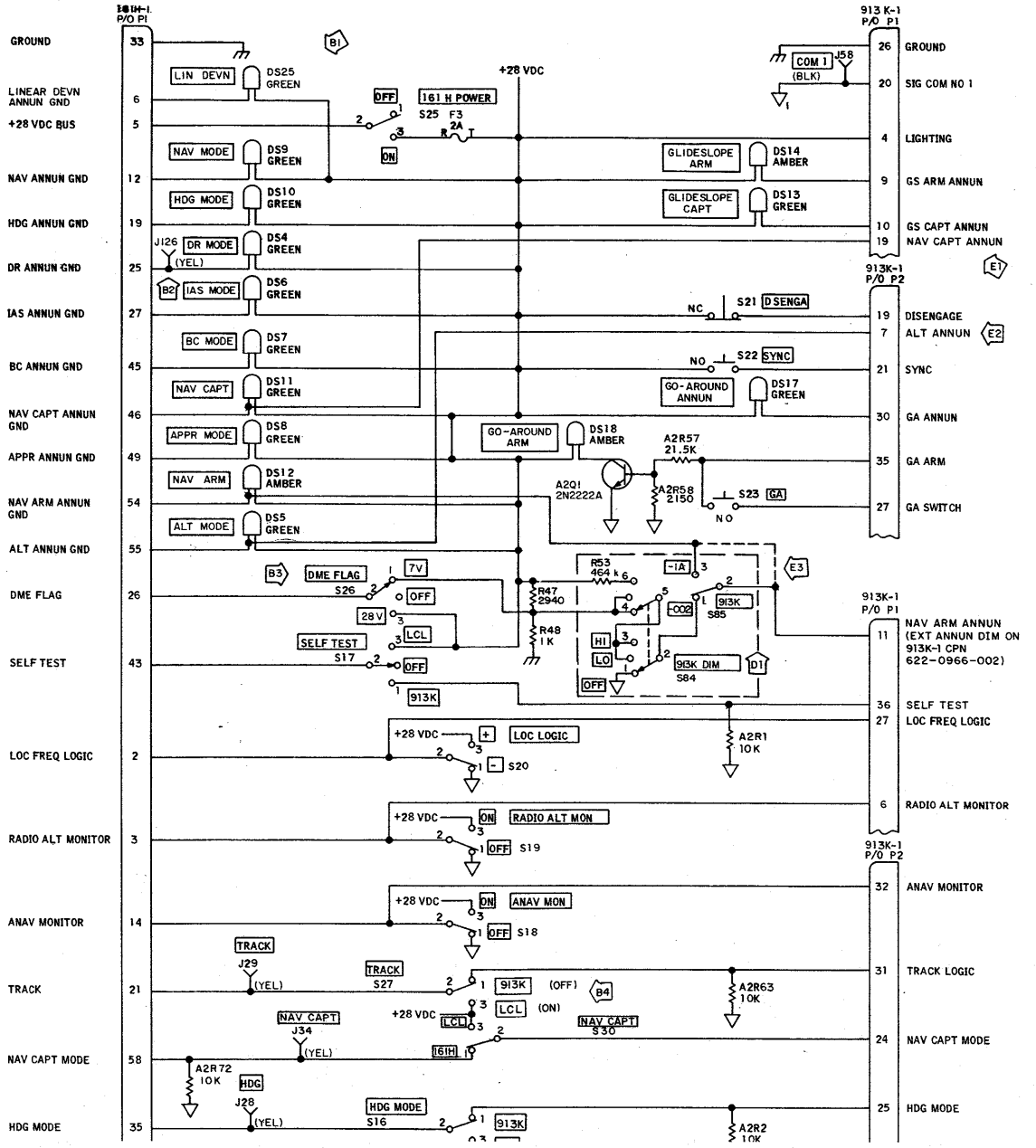
SCHEMATIC CHANGES

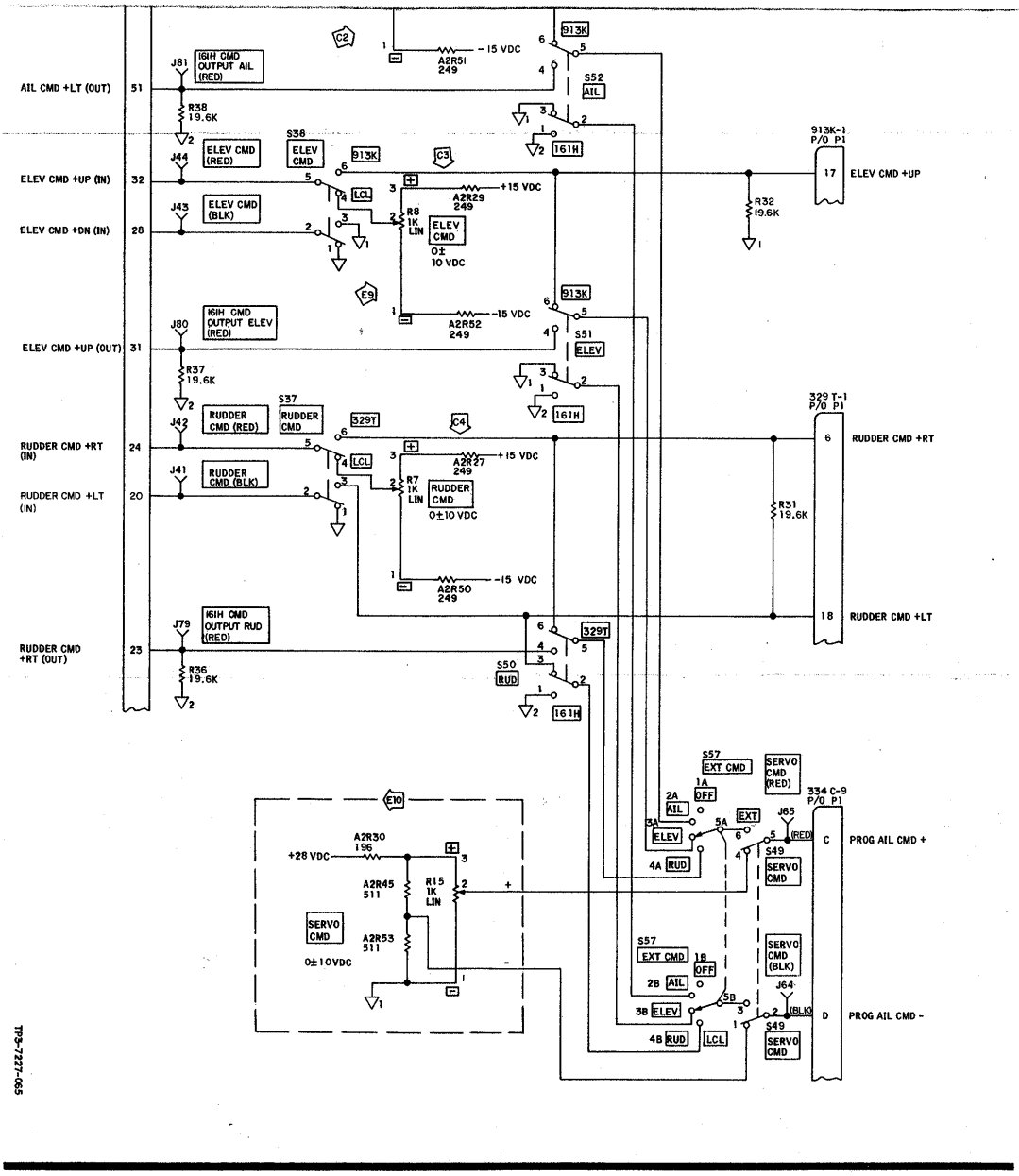
REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
E11 (Sheet 3)	Added load resistors R49 through R52 to facilitate testing of the 913K-1 trim circuits.	5	Serno 50
E12 (Sheet 4)	Added TRIG jack J127 to ramp generator to facilitate testing.	5	Serno 50
E13 (Sheet 5)	Changed A2R65 connection from signal common to +28 V dc.	5	Serno 50
E14 (Sheet 5)	Added ENGAGE annunciator DS26 to test ENG ANNUN signal at 913K-1A P1-34.	5	Serno 50
E15, E16 (Sheet 6)	Added capacitors A2C11 and A2C12, and lowered the value of resistors A2R13, A2R14, A2R21, and A2R22 to increase the output of the plus and minus 15 V dc power supplies.	5	Serno 50
F1 (Sheets 3, 4)	Added lamp driver circuits A3, A4, and A5 to reduce loading of the 614E-41A and 329A-3/4 under test.	6	Serno 90
F2 (Sheet 3)	Added test jacks J128 thru J131 and resistor R53 (464 kΩ), and replaced switch S62 to monitor 334D-6( ) trim output and provide low-voltage servo test.	7	None

972S-2 Autopilot Bench Test Set, Schematic Diagram
Figure 3 (Sheet D)



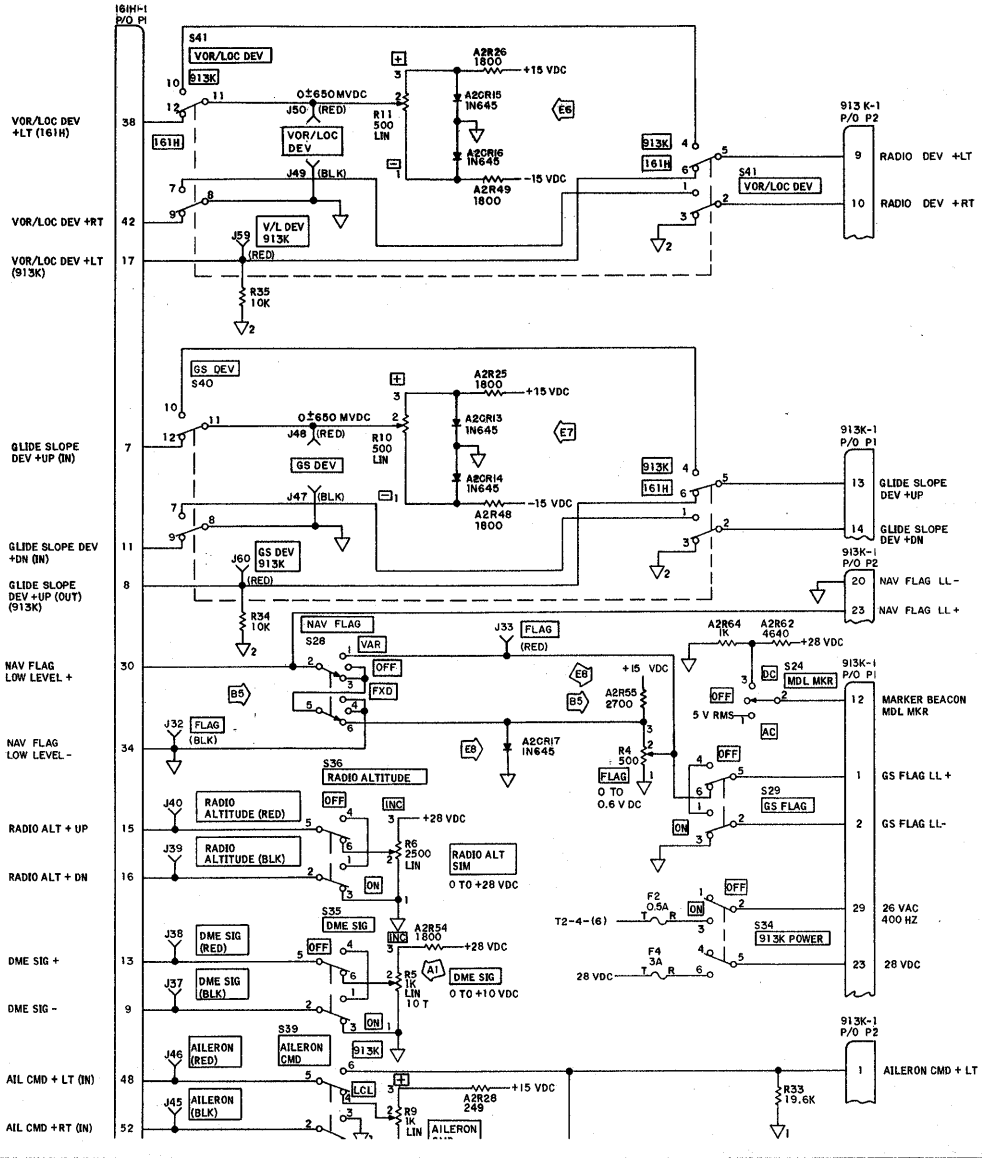
972S-2 Autopilot Bench Test Set, Schematic Diagram
Figure 3 (Sheet 1 of 6)

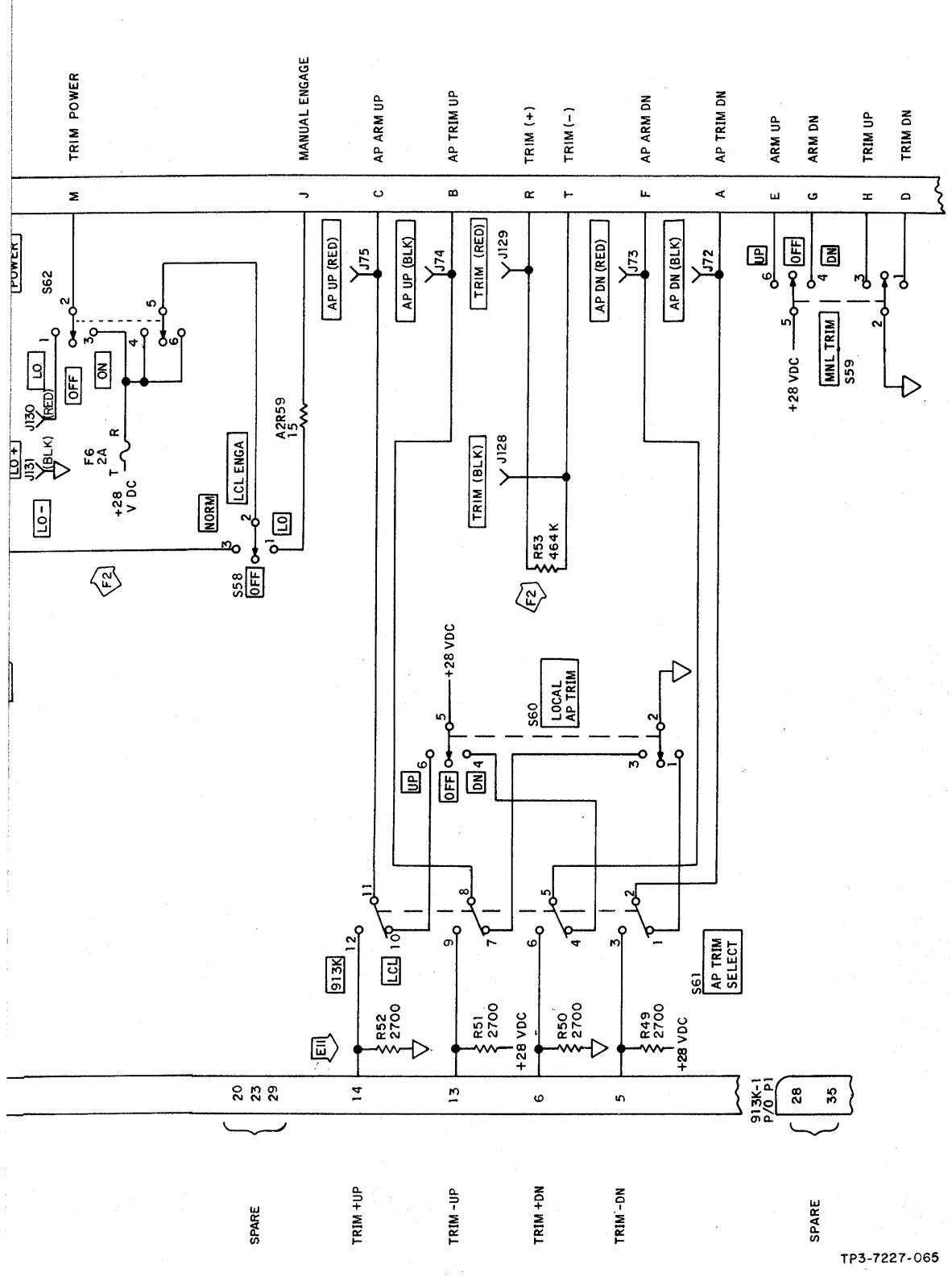

161H-1 P/O P1
913K-1 P/O P1
913K-1 P/O P2
GROUND
LINEAR DEVN ANNUN GND
+28 VDC BUS
NAV ANNUN GND
HDG ANNUN GND
DR ANNUN GND
IAS ANNUN GND
BC ANNUN GND
NAV CAPT ANNUN GND
APPR ANNUN GND
NAV ARM ANNUN GND
ALT ANNUN GND
DME FLAG
SELF TEST
LOC FREQ LOGIC
RADIO ALT MONITOR
ANAV MONITOR
TRACK
NAV CAPT MODE
HDG MODE
LIN DEVN
DS25 GREEN
161 H POWER
S25 F3
2A
NAV MODE
DS9 GREEN
HDG MODE
DS10 GREEN
DR MODE
DS4 GREEN
IAS MODE
DS6 GREEN
BC MODE
DS7 GREEN
NAV CAPT
DS11 GREEN
APPR MODE
DS8 GREEN
NAV ARM
DS12 AMBER
ALT MODE
DS5 GREEN
+28 VDC
GLIDESLOPE ARM
DS14 AMBER
GLIDESLOPE CAPT
DS13 GREEN
GO-AROUND ARM
DS18 AMBER
GO-AROUND ANNUN
DS17 GREEN
A2R57 21.5K
A2R58 2150
A2Q1 2N2222A
S21 DSENGA
S22 SYNC
S23 GA
COM 1 (BLK)
J58
DME FLAG
S26
7V
OFF
28V
LCL
SELF TEST
S17
913K
R47 2940
R48 1K
R53 464K
-1A
002
913K
S85
HI
LO
913K DIM
S84
D1
A2R1 10K
LOC LOGIC
S20
RADIO ALT MON
S19
ANAV MON
S18
TRACK
J29
S27
(OFF)
(ON)
A2R63 10K
NAV CAPT
J34
S30
A2R72 10K
HDG
J28
HDG MODE
S16
A2R2 10K
GROUND
SIG COM NO 1
LIGHTING
GS ARM ANNUN
GS CAPT ANNUN
NAV CAPT ANNUN
DISENGAGE
ALT ANNUN
SYNC
GA ANNUN
GA ARM
GA SWITCH
NAV ARM ANNUN (EXT ANNUN DIM ON 913K-1 CPN 622-0966-002)
SELF TEST
LOC FREQ LOGIC
RADIO ALT MONITOR
ANAV MONITOR
TRACK LOGIC
NAV CAPT MODE
HDG MODE



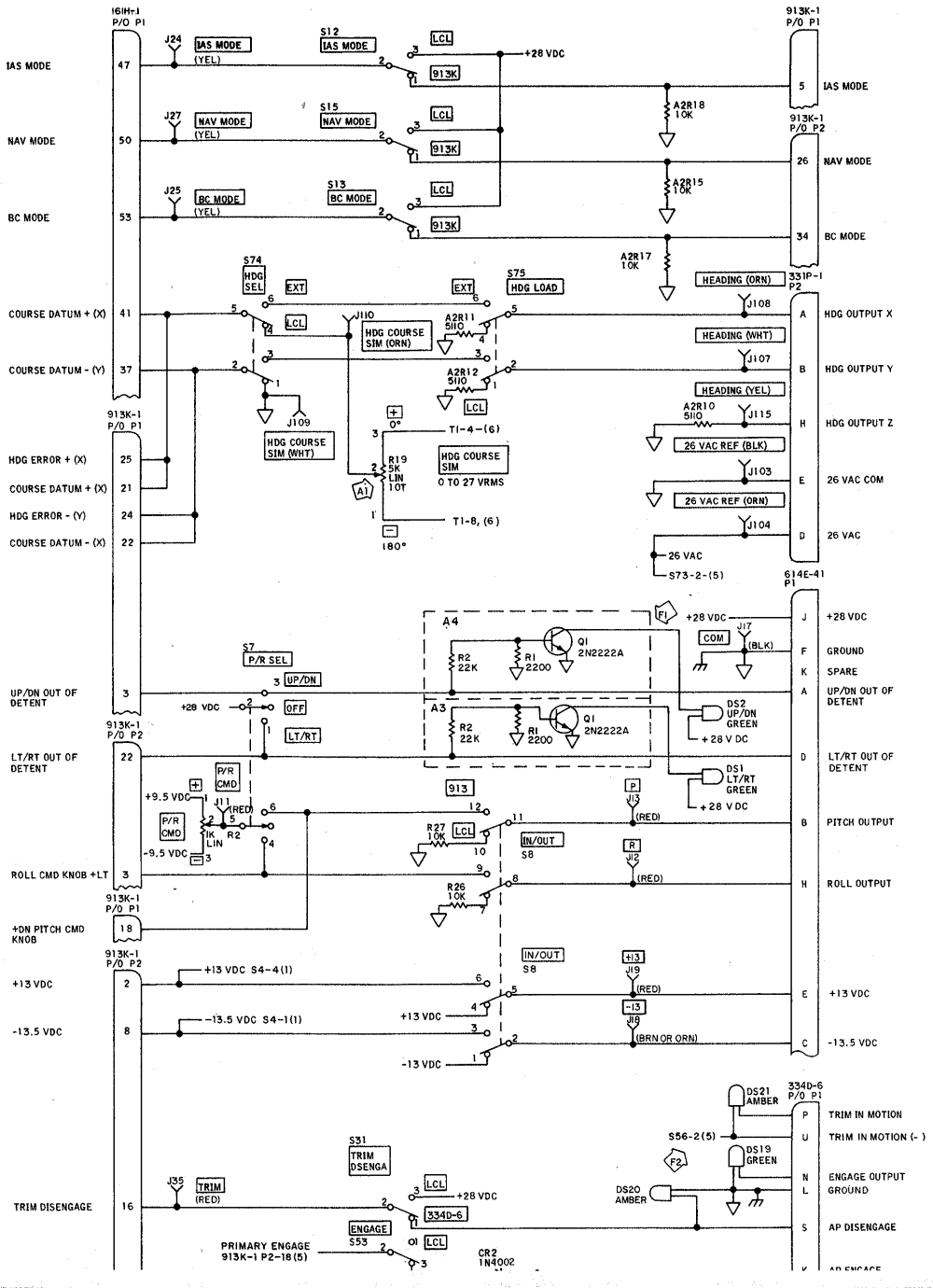
TPS-7227-065

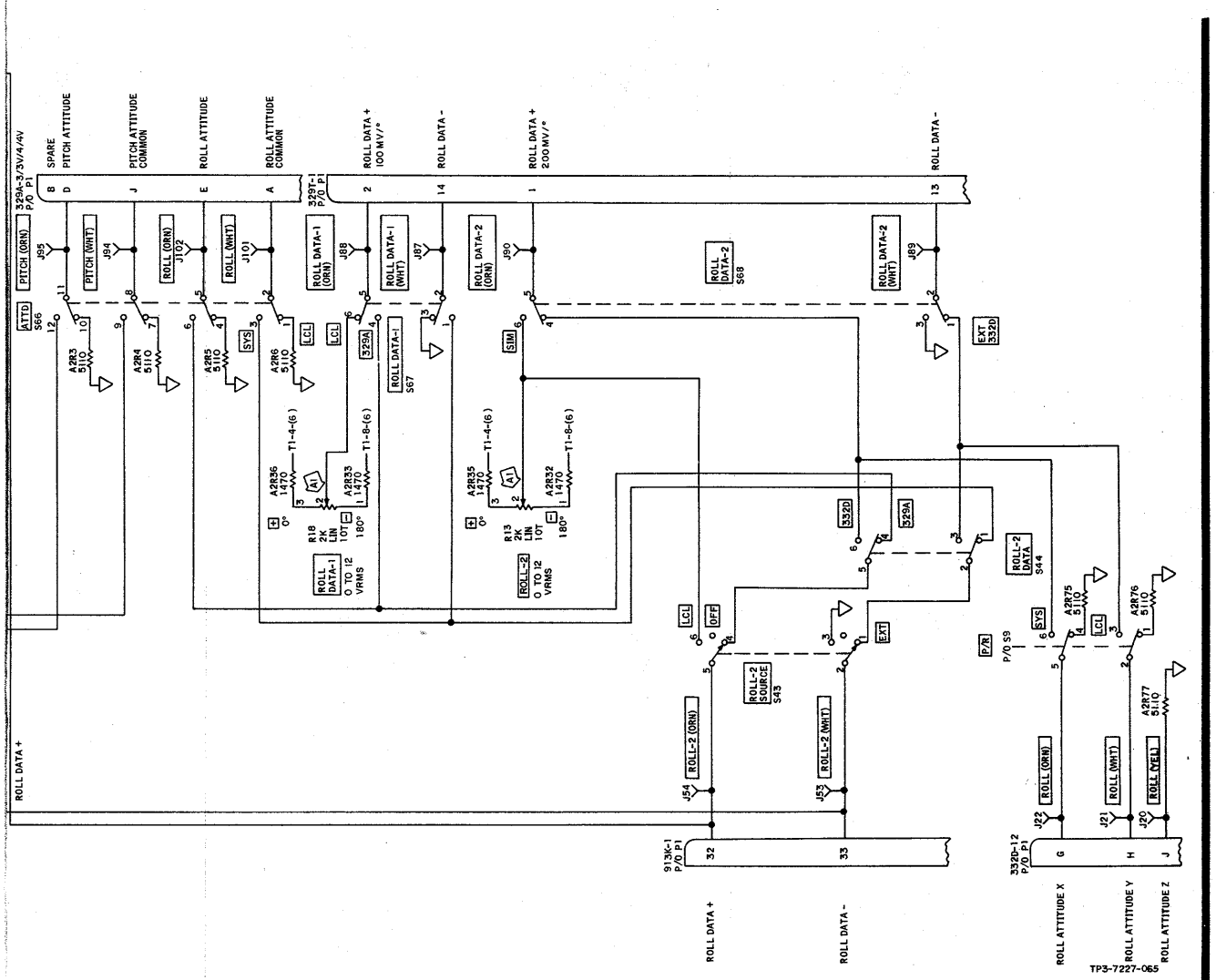
9725-2 Autopilot Bench Test Set, Schematic Diagram
Figure 8 (Sheet 2)


161H-1 P/O P1
VOR/LOC DEV +LT (161H)
VOR/LOC DEV +RT
VOR/LOC DEV +LT (913K)
GLIDE SLOPE DEV +UP (IN)
GLIDE SLOPE DEV +DN (IN)
GLIDE SLOPE DEV +UP (OUT) (913K)
NAV FLAG LOW LEVEL +
NAV FLAG LOW LEVEL -
RADIO ALT + UP
RADIO ALT + DN
DME SIG +
DME SIG -
AIL CMD + LT (IN)
AIL CMD +RT (IN)
S41 VOR/LOC DEV
913K
161H
0±650MVDC
J50 (RED)
VOR/LOC DEV
J49 (BLK)
R11 500 LIN
A2R26 1800
+15 VDC
A2CR15 1N645
A2CR16 1N646
-15 VDC
A2R49 1800
V/L DEV 913K
J59 (RED)
R35 10K
913K-1 P/O P2
9 RADIO DEV +LT
10 RADIO DEV +RT
S40 GS DEV
J48 (RED)
J47 (BLK)
R10 500 LIN
A2R25 1800
A2CR13 1N645
A2CR14 1N645
A2R48 1800
GS DEV 913K
J60 (RED)
R34 10K
913K-1 P/O P1
13 GLIDE SLOPE DEV +UP
14 GLIDE SLOPE DEV +DN
913K-1 P/O P2
20 NAV FLAG LL-
23 NAV FLAG LL+
S28 NAV FLAG
VAR
OFF
FXD
J33 FLAG (RED)
J32 FLAG (BLK)
A2R64 1K
A2R62 4640
+28 VDC
A2R55 2700
+15 VDC
A2CR17 1N645
R4 500
FLAG 0 TO 0.6 V DC
S24 MDL MKR
DC
OFF
5 V RMS
AC
913K-1 P/O P1
12 MARKER BEACON MDL MKR
S36 RADIO ALTITUDE
J40 RADIO ALTITUDE (RED)
J39 RADIO ALTITUDE (BLK)
OFF
INC
ON
R6 2500 LIN
+28 VDC
RADIO ALT SIM 0 TO +28 VDC
S29 GS FLAG
1 GS FLAG LL+
2 GS FLAG LL-
S35 DME SIG
J38 DME SIG (RED)
J37 DME SIG (BLK)
A2R54 1800
R5 1K LIN 10 T
DME SIG 0 TO +10 VDC
F2 0.5A
T2-4-(6)
S34 913K POWER
F4 3A
28 VDC
29 26 VAC 400 HZ
23 28 VDC
S39 AILERON CMD
913K
J46 AILERON (RED)
J45 AILERON (BLK)
LCL
A2R28 249
R9 1K LIN
AILERON
R33 19.6K
913K-1 P/O P2
1 AILERON CMD + LT

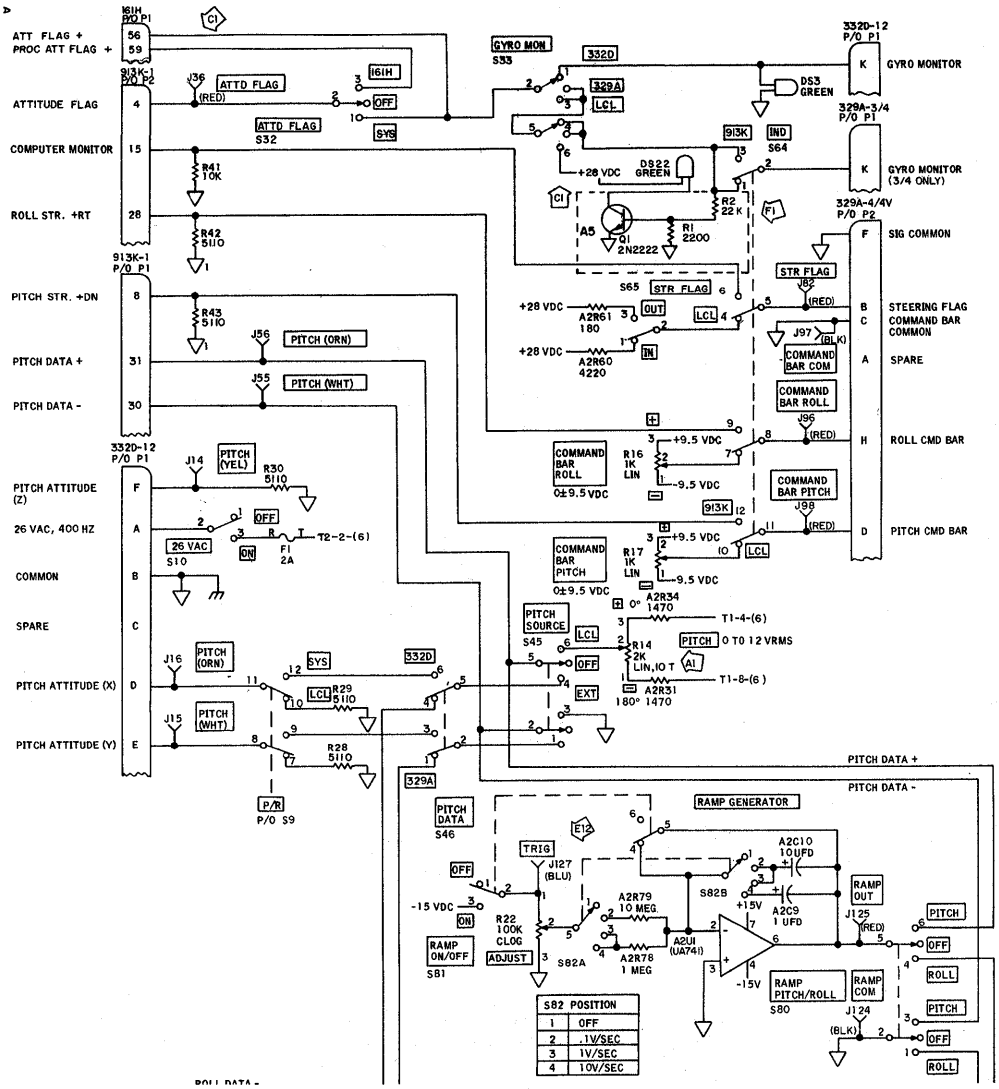


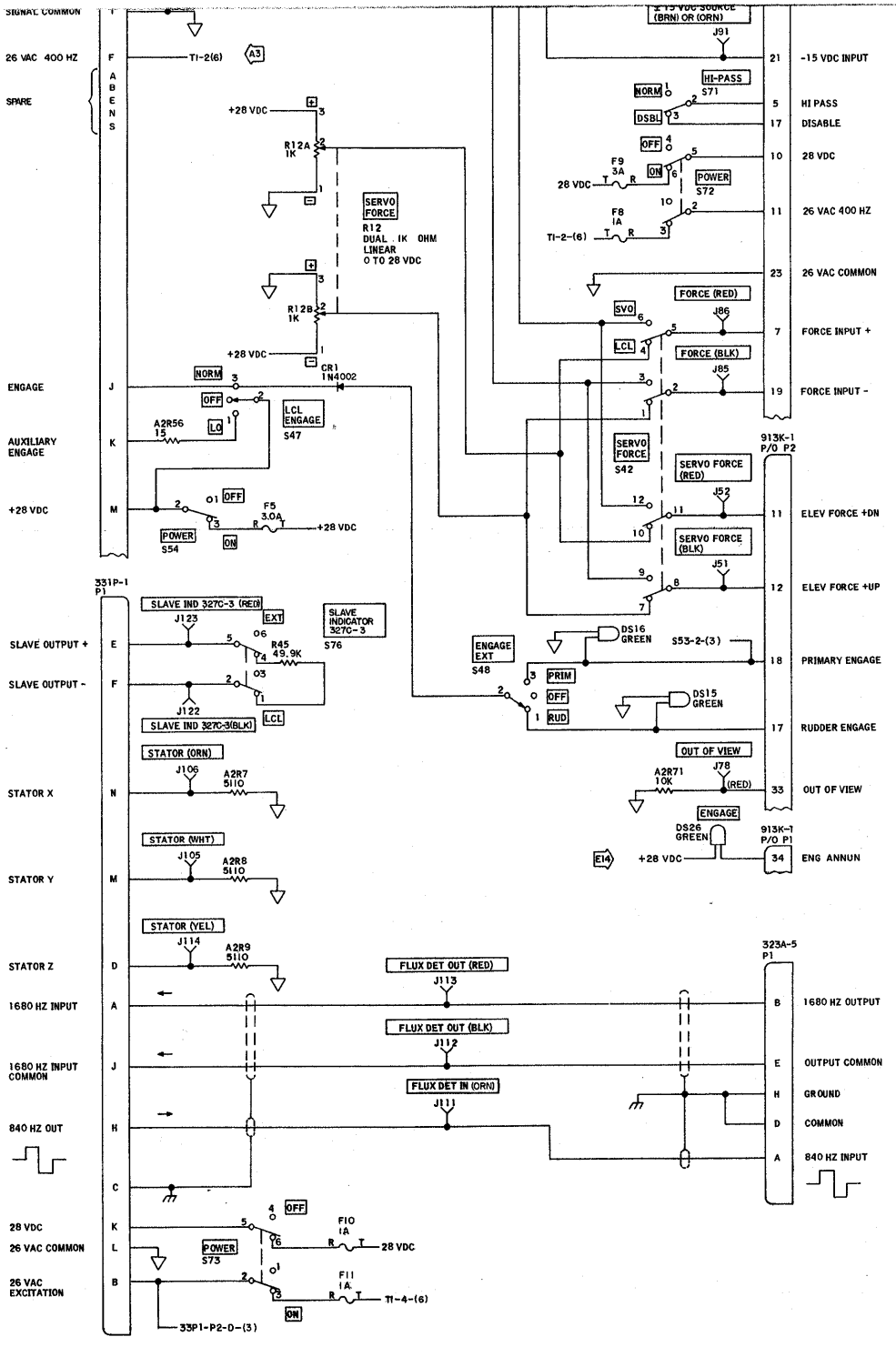
972S-2 Autopilot Bench Test Set, Schematic Diagram
Figure 3 (Sheet 3)


IAS MODE
NAV MODE
BC MODE
COURSE DATUM + (X)
COURSE DATUM - (Y)
HDG ERROR + (X)
COURSE DATUM + (X)
HDG ERROR - (Y)
COURSE DATUM - (X)
UP/DN OUT OF DETENT
LT/RT OUT OF DETENT
ROLL CMD KNOB +LT
+DN PITCH CMD KNOB
+13 VDC
-13.5 VDC
TRIM DISENGAGE
PRIMARY ENGAGE 913K-1 P2-18(5)
+28 VDC
HDG COURSE SIM (ORN)
HDG COURSE SIM (WHT)
HDG COURSE SIM 0 TO 27 VRMS
HEADING (ORN)
HEADING (WHT)
HEADING (YEL)
26 VAC REF (BLK)
26 VAC REF (ORN)
26 VAC
+9.5 VDC
-9.5 VDC
+13 VDC S4-4(1)
-13.5 VDC S4-1(1)
-13 VDC
+28 V DC
HDG OUTPUT X
HDG OUTPUT Y
HDG OUTPUT Z
26 VAC COM
26 VAC
+28 VDC
GROUND
SPARE
UP/DN OUT OF DETENT
LT/RT OUT OF DETENT
PITCH OUTPUT
ROLL OUTPUT
+13 VDC
-13.5 VDC
TRIM IN MOTION
TRIM IN MOTION (-)
ENGAGE OUTPUT
GROUND
AP DISENGAGE
AP ENGAGE
S73-2-(5)
S56-2(5)
CR2 1N4002



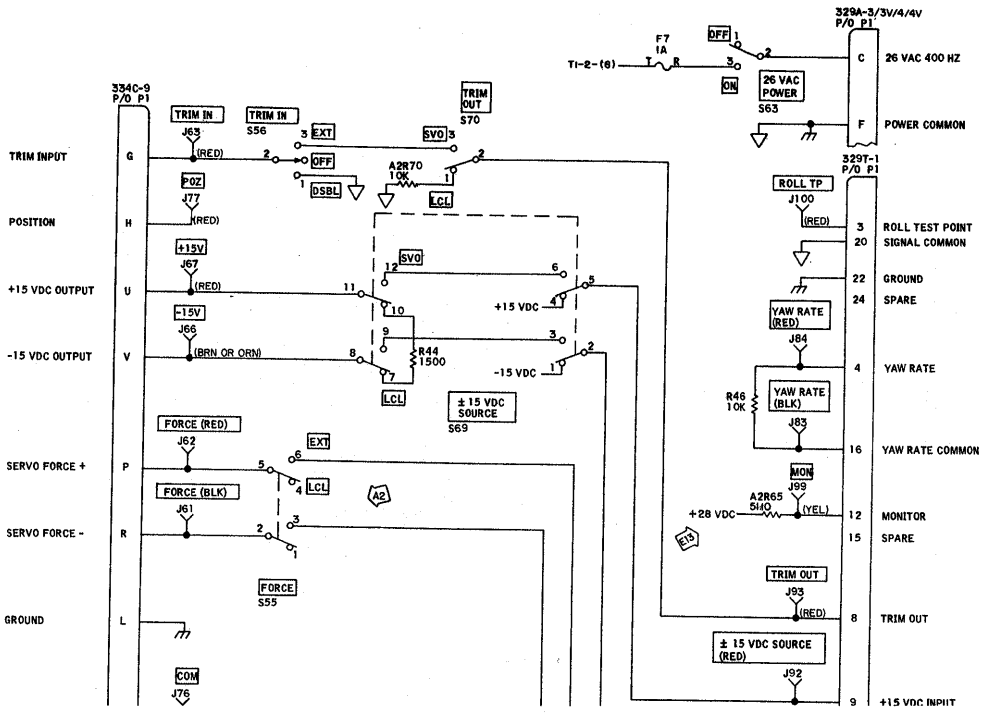
972S-2 Autopilot Bench Test Set, Schematic Diagram
Figure 3 (Sheet 4)

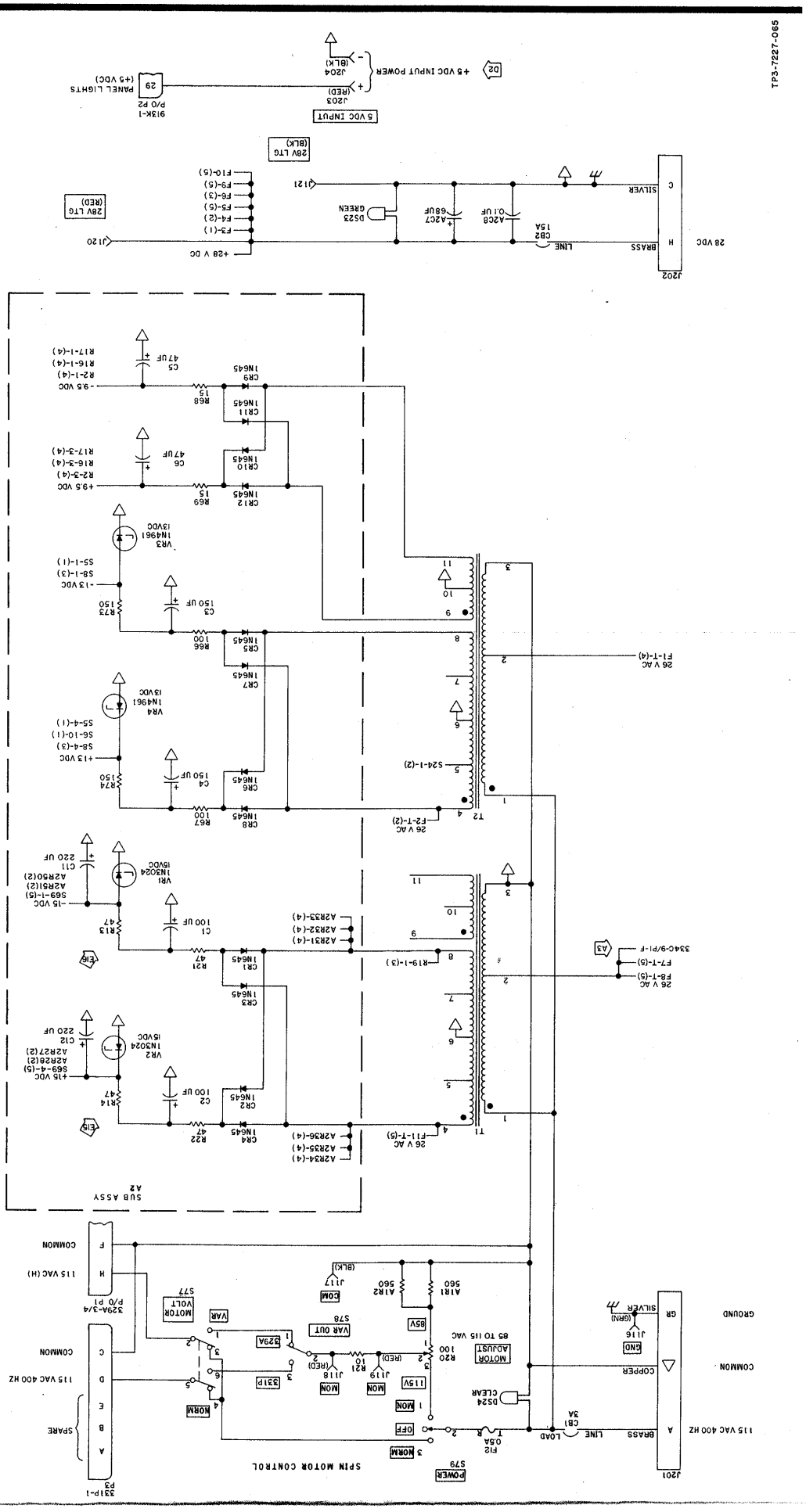

ATT FLAG +
PROC ATT FLAG +
ATTITUDE FLAG
COMPUTER MONITOR
ROLL STR. +RT
PITCH STR. +DN
PITCH DATA +
PITCH DATA -
PITCH ATTITUDE (Z)
26 VAC, 400 HZ
COMMON
SPARE
PITCH ATTITUDE (X)
PITCH ATTITUDE (Y)
GYRO MON S33
ATTD FLAG S32
SYS
OFF
ON
LCL
IND S64
GYRO MONITOR
GYRO MONITOR (3/4 ONLY)
SIG COMMON
STEERING FLAG
COMMAND BAR COMMON
SPARE
ROLL CMD BAR
PITCH CMD BAR
STR FLAG
COMMAND BAR COM
COMMAND BAR ROLL
COMMAND BAR PITCH
PITCH SOURCE S45
PITCH DATA S46
RAMP GENERATOR
RAMP ON/OFF S81
RAMP PITCH/ROLL S80
RAMP OUT
RAMP COM
ADJUST
TRIG
EXT
P/R P/O S9
S82 POSITION
1 OFF
2 .1V/SEC
3 1V/SEC
4 10V/SEC



9725-2 Autopilot Bench Test Set, Schematic Diagram
Figure 3 (Sheet 5)

TP3-7227-065


3340-9 P/O P1
329A-3/3V/4/4V P/O P1
329T-1 P/O P1
TRIM INPUT
POSITION
+15 VDC OUTPUT
-15 VDC OUTPUT
SERVO FORCE +
SERVO FORCE -
GROUND
TRIM IN
TRIM IN S56
TRIM OUT S70
EXT
OFF
DSBL
SVO
LCL
POZ
+15V
-15V
J63
J77
J67
J66
J62
J61
J76
(RED)
(BRN OR ORN)
A2R70 10K
R44 1500
R46 10K
A2R65 5K
FORCE (RED)
FORCE (BLK)
FORCE S55
COM
± 15 VDC SOURCE S69
+15 VDC
-15 VDC
A2
F7 1A
T1-2-(8)
OFF
ON
26 VAC POWER S63
26 VAC 400 HZ
POWER COMMON
ROLL TP J100
ROLL TEST POINT
SIGNAL COMMON
GROUND
SPARE
YAW RATE (RED)
YAW RATE
YAW RATE (BLK)
YAW RATE COMMON
MON
J99
+28 VDC
MONITOR
SPARE
E15
TRIM OUT
J93
TRIM OUT
± 15 VDC SOURCE (RED)
J92
+15 VDC INPUT


TP3-7227-065
+5 VDC INPUT POWER
5 VDC INPUT
J203 (RED)
J204 (BLK)
PANEL LIGHTS (+5 VDC)
28V LTG (RED)
28V LTG (BLK)
+28 V DC
LINE
BRASS
SILVER
28 VDC
J202
J201
J120
J121
D523 GREEN
A26R7 68UF
A26R8 0.1UF
CB2 15A
F3-(1)
F4-(2)
F5-(5)
F6-(3)
F9-(5)
F10-(5)
SUB ASSY A2
CR9 1N645
CR11 1N645
CR10 1N645
CR12 1N645
CR5 1N645
CR7 1N645
CR6 1N645
CR8 1N645
CR1 1N645
CR3 1N645
CR2 1N645
CR4 1N645
C5 47UF
C6 47UF
C3 150 UF
C4 150 UF
C1 100 UF
C2 100 UF
C11 220 UF
C12 220 UF
R68 15
R69 15
R66 100
R67 100
R74 150
R73 150
R13 47
R14 47
R21 47
R22 47
VR1 1N3024 15VDC
VR2 1N3024 15VDC
VR3 1N4961 13VDC
VR4 1N4961 13VDC
-9.5 VDC
+9.5 VDC
-13 VDC
+13 VDC
-15 VDC
+15 VDC
T1
T2
26 V AC
F11-T-(5)
F2-T-(2)
F1-T-(4)
F8-T-(5)
F7-T-(5)
A3
3340-9/P1-F
A2R34-(4)
A2R35-(4)
A2R36-(4)
A2R31-(4)
A2R32-(4)
A2R33-(4)
R19-1-(3)
S24-1-(2)
SPIN MOTOR CONTROL
POWER S79
OFF
NORM
CB1 3A
LOAD
LINE
F12 0.5A
D524 CLEAR
MOTOR ADJUST
R20 100
R21 10
A1R1 560
A1R2 560
J119
J118 (RED)
J117 (BLK)
COM
85V
11SV
MON
VAR OUT
S78
VAR
MOTOR VOLT
S77
329P
329A
NORM
115 VAC 400 HZ
COMMON
SPARE
115 VAC (H)
3294-3/4 P/O P1
331P-1 P3
J116 (GRN)
GND
COPPER
GROUND
S69-1-(5)
S69-4-(5)
A2R50(2)
A2R51(2)
A2R27(2)
A2R28(2)
S7-1-(1)
S8-1-(3)
S6-10-(1)
S8-4-(3)
S5-4-(1)
R16-1-(4)
R17-1-(4)
R2-1-(4)
R16-3-(4)
R17-3-(4)
R2-3-(4)

Collins 972S-2 Autopilot Bench Test Set

Rockwell International

parts list

Collins General Aviation Division

Printed in USA

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list of illustrations

NOTICE: This section replaces third edition dated 1 February 1977.

List of Effective Pages

*The asterisk indicates pages changed, added, or deleted by the current change.

Page No	Issue
*Title	25 Jul 85
*List of Effective Pages	25 Jul 85
*1 thru 15	25 Jul 85
16 Blank	1 Jun 74

Record of Revisions

RETAIN THIS RECORD IN THE FRONT OF MANUAL.
ON RECEIPT OF REVISIONS, INSERT REVISED PAGES IN THE MANUAL, AND ENTER DATE INSERTED AND INITIALS.

REV NO	REVISION DATE	INSERTION DATE/BY	SB NUMBER INCLUDED	REV NO	REVISION DATE	INSERTION DATE/BY	SB NUMBER INCLUDED
1st Ed	1 Jun 74		1 (Rev 1)				
2nd Ed	1 Oct 75		1 (Rev 2), 2, 3				
3rd Ed	1 Feb 77		4, 5				
4th Ed	25 Jul 85		6, 7				

1. CONFIGURATION CONTROL

Collins General Aviation Division of Rockwell International uses the following method for identifying the configuration status of a unit or subassembly.

A 2-character maximum alphabetic identifier will be preceded by the letters REV (revision) and will start with — (dash) if no changes have been processed. The first change will be identified as A, the second as B, continuing through Y to AA, AB, and ultimately to YY (letters I, O, Q, S, X, and Z are not normally used).

Incorporation of design changes in a unit or subassembly that has been returned to Collins General Aviation Division for repair by a customer or that has been removed from the company's finished goods inventory is defined as rework. At the time of rework, the unit or subassembly will be marked again to reflect the design level to which it is being upgraded. This is done by leaving the original marking on the unit or subassembly and adding the letters RWK (rework) followed by the alphabetic identifier of the latest change incorporated in the rework. For example, unit one is marked REV B — RWK F, and unit two is marked REV F. This indicates that both units are at the design level of revision F, but unit one is reworked and they may not look exactly the same.

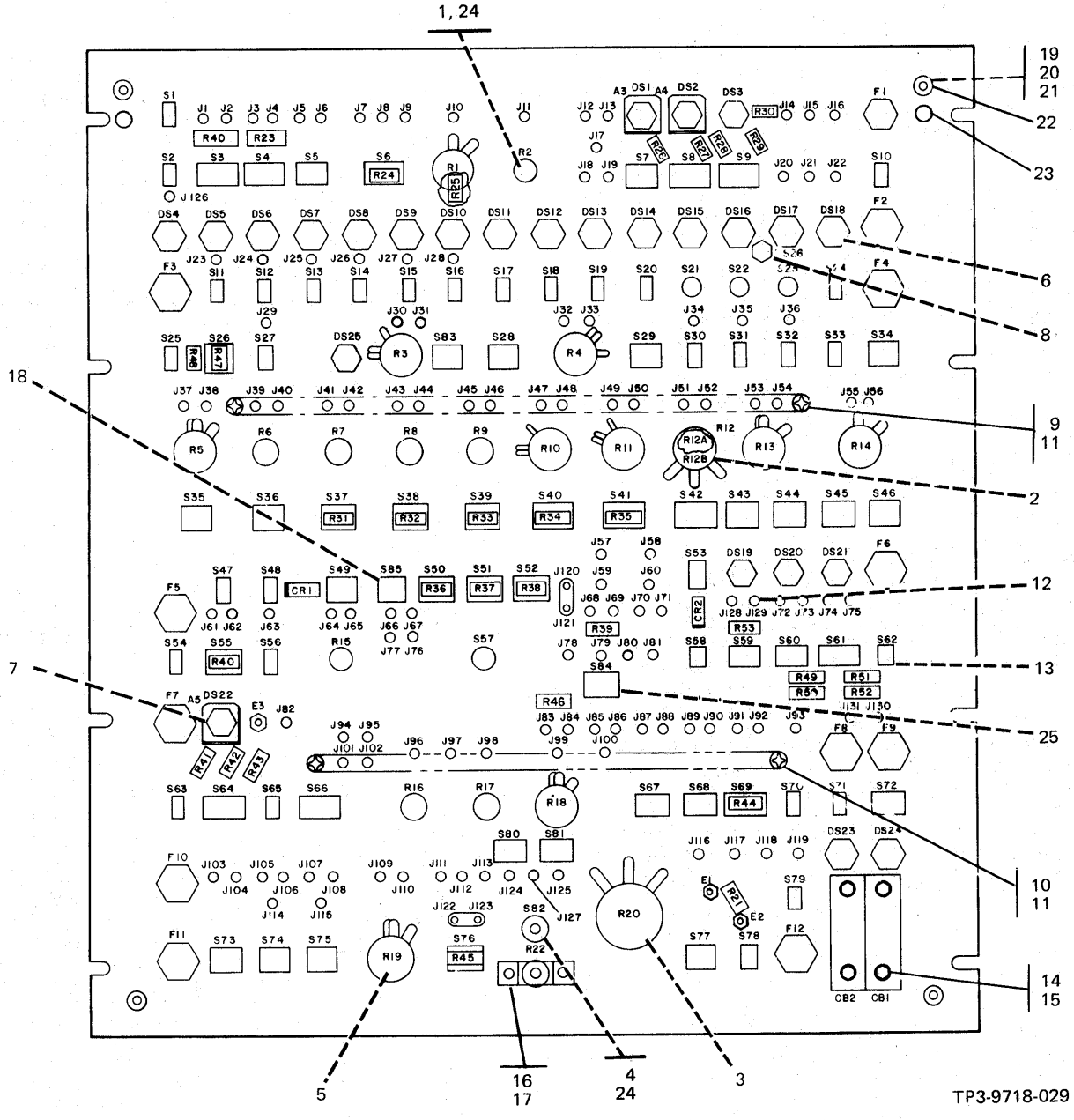
Note

A reworked unit may not contain all design changes made to the reworked identifier but does contain all changes required to make unit operation identical to a newly manufactured unit with the same identifier. Therefore, a unit reworked to a specific identifier may physically appear different from a newly manufactured unit with the same alphabetic identifier.

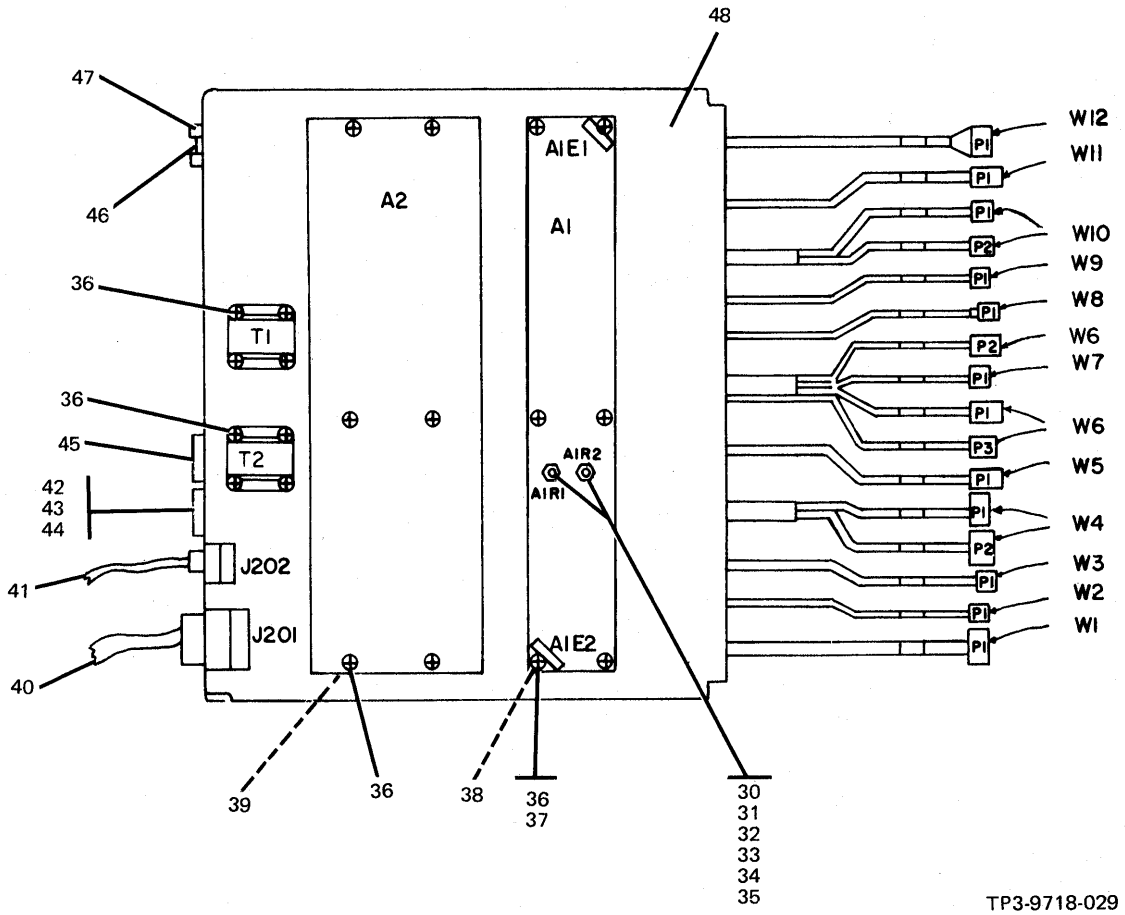
2. CONFIGURATION EFFECTIVITY

Listed below are the units or subassemblies with the latest identifier (change) covered by this section.

UNIT/SUBASSEMBLY	COLLINS PART NUMBER	LATEST EFFECTIVITY
972S-2	622-1668-001	REV W
Cable Bracket A1	621-8021-001	REV -
Circuit Card Assy A2	621-8022-001	REV N
Circuit Card Assy A3	647-4008-002	REV -
Circuit Card Assy A4	647-4008-002	REV -
Circuit Card Assy A5	647-4008-002	REV -



972S-2 Autopilot Bench Test Set, Component Location Diagram
Figure 1 (Sheet 1 of 2)



972S-2 Autopilot Bench Test Set, Component Location Diagram
Figure 1 (Sheet 2)

PARTS LIST
972S-2 AUTOPILOT BENCH TEST SET, CPN 622-1668-001

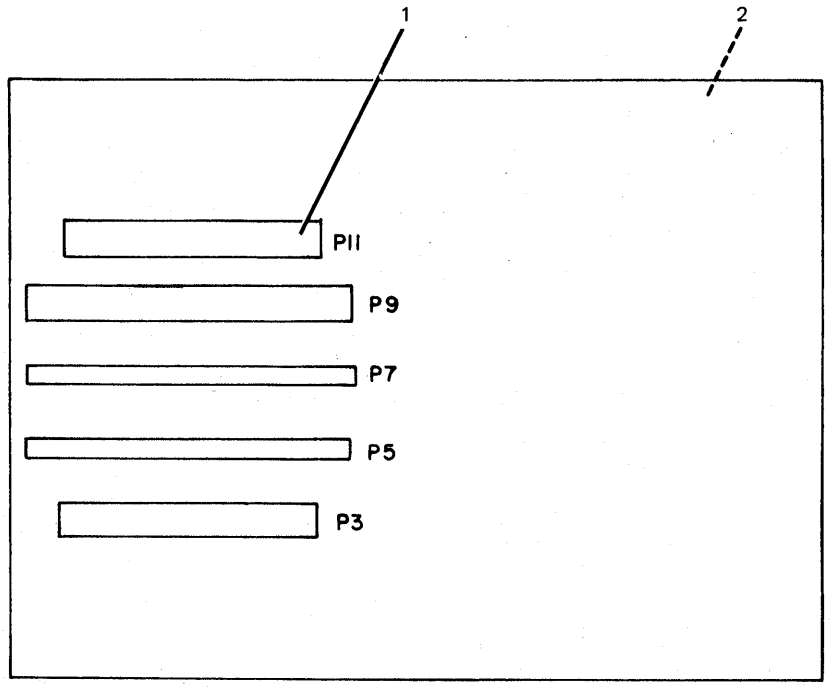
SYMBOL	DESCRIPTION	USED ON CODE	PART NUMBER
-	972S-2 Autopilot Bench Test Set		622-1668-001
-	913K-1 Front extender card (see fig 2)		618-3758-001
-	913K-1 Back extender card (see fig 3)		618-3759-001
-	913K-1A Back extender card (see fig 4)		601-4759-001
A1	Cable bracket		621-8021-001
A1E1	Terminal, ground		547-5305-002
A1E2	Terminal, ground		547-5305-002
A1R1	Res, ww, 560Ω, 5%, 14W		747-0759-000
A1R2	Res, ww, 560Ω, 5%, 14W		747-0759-000
A2	Circuit card assy (see fig 5)		621-8022-001
A3	Circuit card assy (see fig 6)		647-4008-002
A4	Circuit card assy (see fig 6)		647-4008-002
A5	Circuit card assy (see fig 6)		647-4008-002
CB1	Circuit breaker, 3A, 250V		260-4006-200
CB2	Circuit breaker, 15A, 50V		260-4008-460
CR1	Diode, 1N4002		353-6442-020
CR2	Diode, 1N4002		353-6442-020
DS1-DS23	Lamp, midflange, 28V (qty 23)		262-0179-010
DS24	Lamp, neon, C7A		262-0691-000
DS25	Lamp, midflange, 28V (eff rev G, SB2)		262-0179-010
DS26	Lamp, T1, 28V (eff rev K, SB5)		262-1883-020
E1	Terminal, stud		306-1018-000
E2	Terminal, stud		306-1018-000
E3	Terminal, stud (eff rev K, SB5)		306-1018-000
F1	Fuse, 2A, sb		264-0305-000
F2	Fuse, 0.5A		264-0719-000
F3	Fuse, 2A, sb		264-0305-000
F4	Fuse, 3A, sb		264-0306-000
F5	Fuse, 3A, sb		264-0306-000
F6	Fuse, 2A, sb		264-0305-000
F7	Fuse, 1A		264-0721-000
F8	Fuse, 1A		264-0721-000
F9	Fuse, 3A, sb		264-0306-000
F10	Fuse, 1A		264-0721-000
F11	Fuse, 1A		264-0721-000
F12	Fuse, 0.5A		264-0719-000
J1	Jack, tip, blk (eff thru rev P)		306-2241-010
J1	Jack, tip, blk (eff rev R)		360-0151-000
J2	Jack, tip, red (eff thru rev P)		306-2241-030
J2	Jack, tip, red (eff rev R)		360-0150-000
J3	Jack, tip, blk (eff thru rev P)		306-2241-010
J3	Jack, tip, blk (eff rev R)		360-0151-000
J4	Jack, tip, red (eff thru rev P)		306-2241-030
J4	Jack, tip, red (eff rev R)		360-0150-000
J5	Jack, tip, brn (eff thru rev P)		306-2241-020
J5	Jack, tip, org (eff rev R)		360-0154-000
J6	Jack, tip, red (eff thru rev P)		306-2241-030
J6	Jack, tip, red (eff rev R)		360-0150-000
J7	Jack, tip, red (eff thru rev P)		306-2241-030
J7	Jack, tip, red (eff rev R)		360-0150-000
J8	Jack, tip, blk (eff thru rev P)		306-2241-010
J8	Jack, tip, blk (eff rev R)		360-0151-000
J9	Jack, tip, red (eff thru rev P)		306-2241-030
J9	Jack, tip, red (eff rev R)		360-0150-000
J10-J13	Jack, tip, red (qty 4) (eff thru rev N)		306-2241-030
J10-J13	Jack, tip, red (qty 4) (eff rev P)		360-0150-000
J14	Jack, tip, yel (eff thru rev P)		306-2241-050
J14	Jack, tip, yel (eff rev R)		360-0156-000
J15	Jack, tip, wht (eff thru rev P)		306-2241-100
J15	Jack, tip, wht (eff rev R)		360-0149-000
J16	Jack, tip, org (eff thru rev P)		306-2241-040
J16	Jack, tip, org (eff rev R)		360-0154-000
J17	Jack, tip, blk (eff thru rev N)		306-2241-010
J17	Jack, tip, blk (eff rev P)		360-0151-000
J18	Jack, tip, brn (eff thru rev P)		306-2241-020
J18	Jack, tip, org (eff rev R)		360-0154-000
J19	Jack, tip, red (eff thru rev P)		306-2241-030
J19	Jack, tip, red (eff rev R)		360-0150-000
J20	Jack, tip, yel (eff thru rev P)		306-2241-050
J20	Jack, tip, yel (eff rev R)		360-0156-000
J21	Jack, tip, wht (eff thru rev P)		306-2241-100
J21	Jack, tip, wht (eff rev R)		360-0149-000
J22	Jack, tip, org (eff thru rev N)		306-2241-040
J22	Jack, tip, org (eff rev P)		360-0154-000
J23-28	Jack, tip, yel (qty 6) (eff thru rev N)		306-2241-050
J23-28	Jack, tip, yel (qty 6) (eff rev P)		360-0156-000
J29	Jack, tip, yel (eff thru rev F)		306-2241-050
J29	Jack, tip, yel (eff rev G, SB2)		360-0156-000
J30	Jack, tip, blk (eff thru rev F)		306-2241-010
J30	Jack, tip, blk (eff rev G, SB2)		360-0151-000
J31	Jack, tip, red (eff thru rev F)		306-2241-030
J31	Jack, tip, red (eff rev G, SB2)		360-0150-000
J32	Jack, tip, blk (eff thru rev F)		306-2241-010
J32	Jack, tip, blk (eff rev G, SB2)		360-0151-000
J33	Jack, tip, red (eff thru rev F)		306-2241-030
J33	Jack, tip, red (eff rev G, SB2)		360-0150-000
J34	Jack, tip, yel (eff thru rev P)		306-2241-050
J34	Jack, tip, yel (eff rev R)		360-0156-000
J35	Jack, tip, red (eff thru rev P)		306-2241-030
J35	Jack, tip, red (eff rev R)		360-0150-000
J36	Jack, tip, red (eff thru rev P)		306-2241-030
J36	Jack, tip, red (eff rev R)		360-0150-000
J37	Jack, tip, blk (eff thru rev N)		306-2241-010
J37	Jack, tip, blk (eff rev P)		360-0151-000
J38	Jack, tip, red (eff thru rev N)		306-2241-030
J38	Jack, tip, red (eff rev P)		360-0150-000
J39	Jack, tip, blk (eff thru rev N)		306-2241-010
J39	Jack, tip, blk (eff rev P)		360-0151-000
J40	Jack, tip, red (eff thru rev N)		306-2241-030
J40	Jack, tip, red (eff rev P)		360-0150-000
J41	Jack, tip, blk (eff thru rev N)		306-2241-010
J41	Jack, tip, blk (eff rev P)		360-0151-000
J42	Jack, tip, red (eff thru rev N)		306-2241-030
J42	Jack, tip, red (eff rev P)		360-0150-000
J43	Jack, tip, blk (eff thru rev N)		306-2241-010
J43	Jack, tip, blk (eff rev P)		360-0151-000

SYMBOL	DESCRIPTION	USED ON CODE	PART NUMBER
J44	Jack, tip, red (eff thru rev N)		306-2241-030
J44	Jack, tip, red (eff rev P)		360-0150-000
J45	Jack, tip, blk (eff thru rev N)		306-2241-010
J45	Jack, tip, blk (eff rev P)		360-0151-000
J46	Jack, tip, red (eff thru rev N)		306-2241-030
J46	Jack, tip, red (eff rev P)		360-0150-000
J47	Jack, tip, blk (eff thru rev N)		306-2241-010
J47	Jack, tip, blk (eff rev P)		360-0151-000
J48	Jack, tip, red (eff thru rev N)		306-2241-030
J48	Jack, tip, red (eff rev P)		360-0150-000
J49	Jack, tip, blk (eff thru rev N)		306-2241-010
J49	Jack, tip, blk (eff rev P)		360-0151-000
J50	Jack, tip, red (eff thru rev N)		306-2241-030
J50	Jack, tip, red (eff rev P)		360-0150-000
J51	Jack, tip, blk (eff thru rev N)		306-2241-010
J51	Jack, tip, blk (eff rev P)		360-0151-000
J52	Jack, tip, red (eff thru rev N)		306-2241-030
J52	Jack, tip, red (eff rev P)		360-0150-000
J53	Jack, tip, wht (eff thru rev N)		306-2241-100
J53	Jack, tip, wht (eff rev P)		360-0149-000
J54	Jack, tip, org (eff thru rev N)		306-2241-040
J54	Jack, tip, org (eff rev P)		360-0154-000
J55	Jack, tip, wht (eff thru rev N)		306-2241-100
J55	Jack, tip, wht (eff rev P)		360-0149-000
J56	Jack, tip, org (eff thru rev N)		306-2241-040
J56	Jack, tip, org (eff rev P)		360-0154-000
J57	Jack, tip, blk (eff thru rev J)		306-2241-010
J57	Jack, tip, blk (eff rev K, SB5)		360-0151-000
J58	Jack, tip, blk (eff thru rev J)		306-2241-010
J58	Jack, tip, blk (eff rev K, SB5)		360-0151-000
J59	Jack, tip, red (eff thru rev P)		306-2241-030
J59	Jack, tip, red (eff rev R)		360-0150-000
J60	Jack, tip, red (eff thru rev P)		306-2241-030
J60	Jack, tip, red (eff rev R)		360-0150-000
J61	Jack, tip, blk (eff thru rev P)		306-2241-010
J61	Jack, tip, blk (eff rev R)		360-0151-000
J62	Jack, tip, red (eff thru rev P)		306-2241-030
J62	Jack, tip, red (eff rev R)		360-0150-000
J63	Jack, tip, red (eff thru rev P)		306-2241-030
J63	Jack, tip, red (eff rev R)		360-0150-000
J64	Jack, tip, blk (eff thru rev P)		306-2241-010
J64	Jack, tip, blk (eff rev R)		360-0151-000
J65	Jack, tip, red (eff thru rev P)		306-2241-030
J65	Jack, tip, red (eff rev R)		360-0150-000
J66	Jack, tip, brn (eff thru rev P)		306-2241-020
J66	Jack, tip, org (eff rev R)		360-0154-000
J67	Jack, tip, red (eff thru rev P)		306-2241-030
J67	Jack, tip, red (eff rev R)		360-0150-000
J68	Jack, tip, blk (eff thru rev P)		306-2241-010
J68	Jack, tip, blk (eff rev R)		360-0151-000
J69	Jack, tip, red (eff thru rev P)		306-2241-030
J69	Jack, tip, red (eff rev R)		360-0150-000
J70	Jack, tip, blk (eff thru rev P)		306-2241-010
J70	Jack, tip, blk (eff rev R)		360-0151-000
J71	Jack, tip, red (eff thru rev P)		306-2241-030
J71	Jack, tip, red (eff rev R)		360-0150-000
J72	Jack, tip, blk (eff thru rev P)		306-2241-010
J72	Jack, tip, blk (eff rev R)		360-0151-000
J73	Jack, tip, red (eff thru rev P)		306-2241-030
J73	Jack, tip, red (eff rev R)		360-0150-000
J74	Jack, tip, blk (eff thru rev P)		306-2241-010
J74	Jack, tip, blk (eff rev R)		360-0151-000
J75	Jack, tip, red (eff thru rev P)		306-2241-030
J75	Jack, tip, red (eff rev R)		360-0150-000
J76	Jack, tip, blk (eff thru rev P)		306-2241-010
J76	Jack, tip, blk (eff rev R)		360-0151-000
J77-81	Jack, tip, red (qty 5) (eff thru rev P)		306-2241-030
J77-81	Jack, tip, red (qty 5) (eff rev R)		360-0150-000
J82	Jack, tip, red (eff thru rev N)		306-2241-030
J82	Jack, tip, red (eff rev P)		360-0150-000
J83	Jack, tip, blk (eff thru rev P)		306-2241-010
J83	Jack, tip, blk (eff rev R)		360-0151-000
J84	Jack, tip, red (eff thru rev P)		306-2241-030
J84	Jack, tip, red (eff rev R)		360-0150-000
J85	Jack, tip, blk (eff thru rev P)		306-2241-010
J85	Jack, tip, blk (eff rev R)		360-0151-000
J86	Jack, tip, red (eff thru rev P)		306-2241-030
J86	Jack, tip, red (eff rev R)		360-0150-000
J87	Jack, tip, wht (eff thru rev P)		306-2241-100
J87	Jack, tip, wht (eff rev R)		360-0149-000
J88	Jack, tip, org (eff thru rev P)		306-2241-040
J88	Jack, tip, org (eff rev R)		360-0154-000
J89	Jack, tip, wht (eff thru rev P)		306-2241-100
J89	Jack, tip, wht (eff rev R)		360-0149-000
J90	Jack, tip, org (eff thru rev P)		306-2241-040
J90	Jack, tip, org (eff rev R)		360-0154-000
J91	Jack, tip, brn (eff thru rev P)		306-2241-020
J91	Jack, tip, org (eff rev R)		360-0154-000
J92	Jack, tip, red (eff thru rev P)		306-2241-030
J92	Jack, tip, red (eff rev R)		360-0150-000
J93	Jack, tip, red (eff thru rev P)		306-2241-030
J93	Jack, tip, red (eff rev R)		360-0150-000
J94	Jack, tip, wht (eff thru rev P)		306-2241-100
J94	Jack, tip, wht (eff rev R)		360-0149-000
J95	Jack, tip, org (eff thru rev P)		306-2241-040
J95	Jack, tip, org (eff rev R)		360-0154-000
J96	Jack, tip, red (eff thru rev P)		306-2241-030
J96	Jack, tip, red (eff rev R)		360-0150-000
J97	Jack, tip, blk (eff thru rev P)		306-2241-010
J97	Jack, tip, blk (eff rev R)		360-0151-000
J98	Jack, tip, red (eff thru rev P)		306-2241-030
J98	Jack, tip, red (eff rev R)		360-0150-000
J99	Jack, tip, yel (eff thru rev P)		306-2241-050
J99	Jack, tip, yel (eff rev R)		360-0156-000
J100	Jack, tip, red (eff thru rev P)		306-2241-030
J100	Jack, tip, red (eff rev R)		360-0150-000
J101	Jack, tip, wht (eff thru rev P)		306-2241-100
J101	Jack, tip, wht (eff rev R)		360-0149-000
J102	Jack, tip, org (eff thru rev P)		306-2241-040
J102	Jack, tip, org (eff rev R)		360-0154-000
J103	Jack, tip, blk (eff thru rev P)		306-2241-010
J103	Jack, tip, blk (eff rev R)		360-0151-000
J104	Jack, tip, org (eff thru rev P)		306-2241-040
J104	Jack, tip, org (eff rev R)		360-0154-000
J105	Jack, tip, wht (eff thru rev P)		306-2241-100
J105	Jack, tip, wht (eff rev R)		360-0149-000
J106	Jack, tip, org (eff thru rev P)		306-2241-040
J106	Jack, tip, org (eff rev R)		360-0154-000
J107	Jack, tip, wht (eff thru rev P)		306-2241-100
J107	Jack, tip, wht (eff rev R)		360-0149-000
J108	Jack, tip, org (eff thru rev P)		306-2241-040

SYMBOL	DESCRIPTION	USED ON CODE	PART NUMBER
J108	Jack, tip, org (eff rev R)		360-0154-000
J109	Jack, tip, wht (eff thru rev N)		306-2241-100
J109	Jack, tip, wht (eff rev P)		360-0149-000
J110	Jack, tip, org (eff thru rev N)		306-2241-040
J110	Jack, tip, org (eff rev P)		360-0154-000
J111	Jack, tip, org (eff thru rev P)		306-2241-040
J111	Jack, tip, org (eff rev R)		360-0154-000
J112	Jack, tip, blk (eff thru rev P)		306-2241-010
J112	Jack, tip, blk (eff rev R)		360-0151-000
J113	Jack, tip, red (eff thru rev P)		306-2241-030
J113	Jack, tip, red (eff rev R)		360-0150-000
J114	Jack, tip, yel (qty 6) (eff thru rev P)		306-2241-050
J114	Jack, tip, yel (qty 6) (eff rev R)		360-0156-000
J115	Jack, tip, yel (qty 6) (eff thru rev P)		306-2241-050
J115	Jack, tip, yel (qty 6) (eff rev R)		360-0156-000
J116	Jack, tip, grn		360-0153-000
J117	Jack, tip, blk		360-0151-000
J118	Jack, tip, red		360-0150-000
J119	Jack, tip, red		360-0150-000
J120	Post, binding (eff thru rev R)		372-2106-000
J121	Post, binding (eff thru rev R)		372-2106-000
J120, J121	Post, binding, dual (eff rev T)		372-0118-000
J122	Post, binding (eff thru rev R)		372-2106-000
J123	Post, binding (eff thru rev R)		372-2106-000
J122, J123	Post, binding, dual (eff rev T)		372-0118-000
J124	Jack, tip, blk (eff thru rev P)		306-2241-010
J124	Jack, tip, blk (eff rev R)		360-0151-000
J125	Jack, tip, red (eff thru rev P)		306-2241-030
J125	Jack, tip, red (eff rev R)		360-0150-000
J126	Jack, tip, yel (eff rev G, SB2)		360-0156-000
J127	Jack, tip, blu (eff rev K, SB5)		360-0155-000
J128	Jack, tip, blk (eff rev W, SB7)		360-0151-000
J129	Jack, tip, red (eff rev W, SB7)		360-0150-000
J130	Jack, tip, red (eff rev W, SB7)		360-0150-000
J131	Jack, tip, blk (eff rev W, SB7)		360-0151-000
J132-J200	Not used		
J201	Connector, rcpt, elec		368-0135-010
J202	Connector, rcpt, elec		368-0134-000
R1	Res, var, 1kΩ, 20%, 1/2W (eff thru rev B)		380-1563-000
R1	Res, var, 1kΩ, 5%, 2W (eff rev B, SB1)		381-1735-030
R2	Res, var, 1kΩ, 20%, 1/2W		380-1563-000
R3	Res, var, 1kΩ, 20%, 1/2W (eff thru rev J)		380-1563-000
R3	Res, var, 1kΩ, 5%, 2W (eff rev K, SB5)		381-1735-030
R4	Res, var, 500Ω, 20%, 1/2W (eff thru rev J)		380-1588-000
R4	Res, var, 500Ω, 3%, 2W (eff rev K, SB5)		381-1648-010
R5	Res, var, 1kΩ, 20%, 1/2W (eff thru rev B)		380-1563-000
R5	Res, var, 1kΩ, 5%, 2W (eff rev B, SB1)		381-1735-030
R6	Res, var, 2.5kΩ, 20%, 1/2W		380-1589-000
R7	Res, var, 1kΩ, 20%, 1/2W		380-1563-000
R8	Res, var, 1kΩ, 20%, 1/2W		380-1563-000
R9	Res, var, 1kΩ, 20%, 1/2W		380-1563-000
R10	Res, var, 500Ω, 20%, 1/2W (eff thru rev J)		380-1588-000
R10	Res, var, 500Ω, 3%, 2W (eff rev K, SB5)		381-1648-010
R11	Res, var, 500Ω, 20%, 1/2W (eff thru rev J)		380-1588-000
R11	Res, var, 500Ω, 3%, 2W (eff rev K, SB5)		381-1648-010
R12	Res, var, dual, 1kΩ, 10%, 2W		380-3464-000
R13	Res, var, 2.5kΩ, 20%, 1/2W (eff thru rev B)		380-1589-000
R13	Res, var, 2kΩ, 3%, 2W (eff rev B, SB1)		381-1494-000
R14	Res, var, 2.5kΩ, 20%, 1/2W (eff thru rev B)		380-1589-000
R14	Res, var, 2kΩ, 3%, 2W (eff rev B, SB1)		381-1494-000
R15	Res, var, 1kΩ, 20%, 1/2W		380-1563-000
R16	Res, var, 1kΩ, 20%, 1/2W		380-1563-000
R17	Res, var, 1kΩ, 20%, 1/2W		380-1563-000
R18	Res, var, 2.5kΩ, 20%, 1/2W (eff thru rev B)		380-1589-000
R18	Res, var, 2kΩ, 3%, 2W (eff rev B, SB1)		381-1494-000
R19	Res, var, 5kΩ, 20%, 1W (eff thru rev B)		380-2506-000
R19	Res, var, 5kΩ, 3%, 2W (eff rev B, SB1)		381-1648-020
R20	Res, var, ww, 100Ω, 10%, 25W		749-0023-000
R21	Res, mf, 10Ω, 1%, 1/2W		705-7000-000
R22	Res, var, 100kΩ, 20%, 1/2W		380-1606-000
R23	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R24	Res, mf, 19.6kΩ, 1%, 1/4W		705-6658-000
R25	Res, mf, 866Ω, 1%, 1/4W		705-6593-000
R26	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R27	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R28	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R29	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R30	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R31	Res, mf, 19.6kΩ, 1%, 1/4W		705-6658-000
R32	Res, mf, 19.6kΩ, 1%, 1/4W		705-6658-000
R33	Res, mf, 19.6kΩ, 1%, 1/4W		705-6658-000
R34	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R35	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R36	Res, mf, 19.6kΩ, 1%, 1/4W		705-6658-000
R37	Res, mf, 19.6kΩ, 1%, 1/4W		705-6658-000
R38	Res, mf, 19.6kΩ, 1%, 1/4W		705-6658-000
R39	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R40	Res, mf, 10kΩ, 1%, 1/4W (eff thru rev B)		705-6644-000
R40	Not used eff rev C, SB1 without SB5		
R40	Res, mf, 10kΩ, 1%, 1/4W (eff rev K, SB5)		705-6644-000
R41	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R42	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R43	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R44	Res, cc, 1.5kΩ, 10%, 1W		745-3359-000

SYMBOL	DESCRIPTION	USED ON CODE	PART NUMBER
R45	Res, mf, 49.9kΩ, 1%, 1/8W		705-1468-720
R46	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R47	Res, mf, 2.94kΩ, 1%, 1/4W (eff rev G, SB2)		705-3602-180
R48	Res, mf, 1kΩ, 1%, 1/8W (eff rev G, SB2)		705-0996-000
R49	Res, cc, 2.7kΩ, 10%, 1/2W (eff rev K, SB5)		745-1370-000
R50	Res, cc, 2.7kΩ, 10%, 1/2W (eff rev K, SB5)		745-1370-000
R51	Res, cc, 2.7kΩ, 10%, 1/2W (eff rev K, SB5)		745-1370-000
R52	Res, cc, 2.7kΩ, 10%, 1/2W (eff rev K, SB5)		745-1370-000
R53	Res, mf, 464kΩ, 1%, 1/4W (eff rev W, SB7)		705-6724-000
S1	Switch, toggle, spdt		266-5321-010
S2	Switch, toggle, spdt		266-5321-010
S3	Switch, toggle, 4p2t		266-5321-110
S4	Switch, toggle, 4p2t		266-5321-110
S5	Switch, toggle, dpdt		266-5321-060
S6	Switch, toggle, 4p2t		266-5321-110
S7	Switch, toggle, dpdt, ctr off		266-5321-070
S8	Switch, toggle, 4p2t		266-5321-110
S9	Switch, toggle, 4p2t		266-5321-110
S10-S16	Switch, toggle, spdt		266-5321-010
S17	Switch, toggle, spdt, ctr off		266-5321-020
S18	Switch, toggle, spdt		266-5321-010
S19	Switch, toggle, spdt		266-5321-010
S20	Switch, toggle, spdt		266-5321-010
S21	Switch, pushbutton, mom, n.c.		260-2708-000
S22	Switch, pushbutton, mom, n.o.		260-2709-000
S23	Switch, pushbutton, mom, n.o.		260-2709-000
S24	Switch, toggle, spdt, ctr off		266-5321-020
S25	Switch, toggle, spdt		266-5321-010
S26	Switch, toggle, spdt, ctr off		266-5321-020
S27	Switch, toggle, spdt		266-5321-010
S28	Switch, toggle, spdt (eff thru rev F)		266-5321-010
S28	Switch, toggle, sp3t (eff rev G, SB2)		266-5321-400
S29	Switch, toggle, dpdt		266-5321-060
S30	Switch, toggle, spdt		266-5321-010
S31	Switch, toggle, spdt		266-5321-010
S32	Switch, toggle, spdt, ctr off		266-5321-020
S33	Switch, toggle, sp3t		266-5321-400
S34	Switch, toggle, dpdt		266-5321-060
S35	Switch, toggle, dpdt		266-5321-060
S36	Switch, toggle, dpdt		266-5321-060
S37	Switch, toggle, dpdt		266-5321-060
S38	Switch, toggle, dpdt		266-5321-060
S39	Switch, toggle, dpdt		266-5321-060
S40	Switch, toggle, 4p2t		266-5321-110
S41	Switch, toggle, 4p2t		266-5321-110
S42	Switch, toggle, 4p2t		266-5321-110
S43	Switch, toggle, dpdt, ctr off		266-5321-070
S44	Switch, toggle, dpdt		266-5321-060
S45	Switch, toggle, dpdt, ctr off		266-5321-070
S46	Switch, toggle, dpdt		266-5321-060
S47	Switch, toggle, spdt, ctr off		266-5321-020
S48	Switch, toggle, spdt, ctr off		266-5321-020
S49	Switch, toggle, dpdt		266-5321-060
S50	Switch, toggle, dpdt		266-5321-060
S51	Switch, toggle, dpdt		266-5321-060
S52	Switch, toggle, dpdt		266-5321-060
S53	Switch, toggle, spdt		266-5321-010
S54	Switch, toggle, spdt		266-5321-010
S55	Switch, toggle, dpdt		266-5321-060
S56	Switch, toggle, spdt, ctr off		266-5321-020
S57	Switch, rotary		259-9487-120
S58	Switch, toggle, spdt, ctr off		266-5321-020
S59	Switch, toggle, dpdt, ctr off		266-5321-070
S60	Switch, toggle, dpdt, ctr off		266-5321-070
S61	Switch, toggle, 4p2t		266-5321-110
S62	Switch, toggle, spdt (eff thru rev V)		266-5321-010
S62	Switch, toggle, dpdt, ctr off (eff rev W, SB7)		266-5321-070
S63	Switch, toggle, spdt		266-5321-010
S64	Switch, toggle, 4p2t		266-5321-110
S65	Switch, toggle, spdt		266-5321-010
S66	Switch, toggle, 4p2t		266-5321-110
S67	Switch, toggle, dpdt		266-5321-060
S68	Switch, toggle, dpdt		266-5321-060
S69	Switch, toggle, 4p2t		266-5321-110
S70	Switch, toggle, spdt		266-5321-010
S71	Switch, toggle, spdt		266-5321-010
S72	Switch, toggle, dpdt		266-5321-060
S73	Switch, toggle, dpdt		266-5321-060
S74	Switch, toggle, dpdt		266-5321-060
S75	Switch, toggle, dpdt		266-5321-060
S76	Switch, toggle, dpdt		266-5321-060
S77	Switch, toggle, dpdt		266-5321-060
S78	Switch, toggle, spdt		266-5321-010
S79	Switch, toggle, spdt, ctr off		266-5321-020
S80	Switch, toggle, dpdt, ctr off		266-5321-070
S81	Switch, toggle, dpdt		266-5321-060
S82	Switch, rotary		259-9487-120
S83	Switch, toggle, dpdt		266-5321-060
S84	Switch, toggle, sp3t (eff SB4)		266-5321-400
S85	Switch, toggle, spdt (eff rev K, SB5)		266-5321-150
T1	Transformer, 115V, 400Hz		672-0255-010
T2	Transformer, 115V, 400Hz		672-0255-010
W1	Cable, 329T-1		621-8034-001
W1P1	Connector,		372-2155-000
W2	Cable, 614E-41		621-8035-001
W2P1	Connector,		372-1539-000
W3	Cable, 332D-11		621-8036-001
W3P1	Connector,		371-6411-000
W4	Cable, 913K-1		621-8037-001
W4P1	Connector,		372-2156-000
W4P2	Connector,		372-2156-000
W5	Cable, 334D-6		621-8038-001
W5P1	Connector,		371-2536-000
W6	Cable, 331P		621-8039-001
W6P1	Connector,		372-2186-000
W6P2	Connector,		371-1064-000
W6P3	Connector,		371-0377-010
W7	Cable, 323A-5		621-8040-001
W7P1	Connector,		371-2186-000
W8	Cable, 590B-3		621-8041-001

SYMBOL	DESCRIPTION	USED ON CODE	PART NUMBER
W8P1	Connector,		371-6234-000
W9	Cable, 590A-6		621-8042-001
W9P1	Connector,		372-1539-000
W10	Cable, 329A		621-8043-001
W10P1	Connector,		372-1539-000
W10P2	Connector,		372-1536-000
W11	Cable, 334C-9		621-8044-001
W11P1	Connector,		371-2536-000
W12	Cable, 161H-1		621-8045-001
W12P1	Connector,		618-3629-001
XDS1-XDS24	Holder, lamp (qty 24)		262-0375-000
XDS25	Holder, lamp (eff rev G, SB2)		262-0375-000
XDS26	Holder, lamp (eff rev K, SB5)		262-2185-030
XF1-XF12	Holder, fuse (qty 12)		265-1171-000
1	Knob (qty 12) (eff thru rev J)		777-0614-001
1	Knob (qty 8) (eff rev K, SB5)		777-0614-001
2	Knob		757-0228-002
3	Knob		757-0228-003
4	Knob (qty 2)		775-9689-001
5	Knob (qty 5) (eff thru rev B)		777-0614-001
5	Knob (qty 6) (eff rev C thru J, SB1)		757-0228-001
5	Knob (qty 10) (eff rev K, SB5)		757-0228-001
6	Lens, amber (qty 5)		262-0378-000
7	Lens, green (qty 18) (eff thru rev F)		262-0377-000
7	Lens, green (qty 19) (eff rev G, SB2)		262-0377-000
8	Lens, green (eff rev K, SB5)		262-1890-000
9	Bar, mounting		621-8028-001
10	Bar, mounting		621-8028-002
11	Screw, pfh, 8-32 x 3/8 (qty 10)		342-0078-000
12	Overlay, SB7		634-3574-001
13	Overlay, SB7		634-3575-001
14	Screw, pfh, 6-32 x 1/4 (qty 4)		342-0060-000
15	Washer, lock, bronze (qty 4)		310-0080-000
16	Bracket, trim pot		621-8019-001
17	Screw, pfh, 4-40 x 3/8 (qty 4)		342-0046-000
18	Overlay, SB5		629-9722-001
19	Handle (qty 2)		763-3339-015
20	Post, handle (qty 6)		763-3341-001
21	Stud, (qty 6)		312-0113-000
22	Screw, pfh, 10-32 x 1/2 (qty 6)		342-0224-000
23	Screw, pfh, 8-32 x 7/16 (qty 16)		342-0079-000
24	Setscrew, cup, 4-40 x 3/16 (qty 20)		328-5029-000
25	Overlay, SB4		629-9466-001
26-29	Not used		
30	Screw, pph, 6-32 x 7/16 (qty 4)		343-0170-000
31	Washer, ext tooth, 0.141 x 0.32 (qty 2)		373-8020-000
32	Post, (qty 2)		015-0553-000
33	Washer, mica (qty 2)		302-0348-000
34	Washer, mica (qty 2)		302-0347-000
35	Washer, flat (qty 2)		310-0447-000
36	Screw, pph, 6-32 x 5/16 (qty 32)		343-0168-000
37	Washer, int tooth, 0.141 x 0.295 (qty 2)		373-0001-000
38	Post, 6-32 x 1.5 x 1/4 (qty 6)		540-9229-003
39	Post, hex, 6-32 x 1.0 (qty 6)		540-9221-003
40	Cable, ac power		621-8049-001
41	Cable, dc power		621-8048-001
42	Plate, ident		609-7644-000
43	Screw, pph, 2-56 x 1/4 (qty 2)		343-0299-000
44	Nut, hex, 2-56 (qty 2)		313-0037-000
45	Plate, modification		623-8079-001
46	Overlay, SB4		629-9468-001
47	Post, binding (eff SB4)		372-2240-010
48	Plate, base		621-8023-002
-	Washer, flat (qty 21)		310-0047-000
-	Nut, hex, 3/8-32 (qty 4)		313-0064-000
-	Nut, hex, 1/4-32 (qty 9)		334-0287-000
-	Washer, lock (qty 2)		373-0085-000
-	Washer, int tooth, 0.256 x 0.478 (qty 9)		373-3050-000
-	Washer, lock (qty 10)		310-0071-000
-	Nut, hex, 6-32 (qty 4)		313-0045-000
-	Screw, mach, sst, 4-40 x 5/16 (qty 6)		330-2291-000
-	Screw, pph, 8-32 x 3/8 (qty 49)		343-0187-000
-	Grommet, rubber, 9/16 id (qty 2)		201-0025-000
-	Grommet, rubber, 3/8 id (qty 4)		201-0022-000
-	Grommet, rubber, 1/4 id (qty 3)		201-0020-000
-	Grommet, rubber, 1/2 id (qty 2)		201-0024-000
-	Screw, 2-56 x 1/4 (qty 3)		342-0133-001

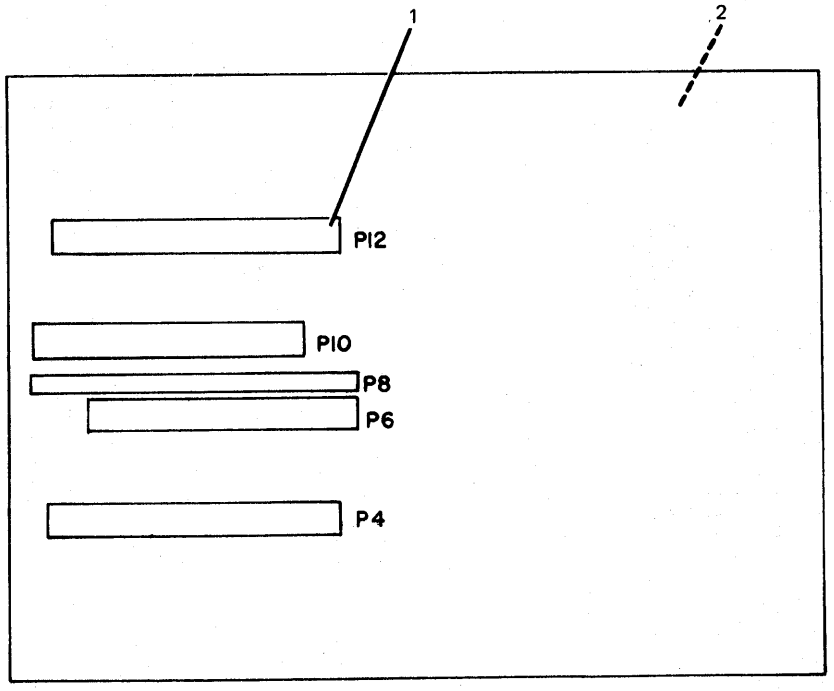


TP6-4019-019

913K-1 Front Extender Card, Component Location Diagram
Figure 2

PARTS LIST
913K-1 FRONT EXTENDER CARD, CPN 618-3758-001

SYMBOL	DESCRIPTION	USED ON CODE	PART NUMBER
-	913K-1 Front extender card		618-3758-001
P3	Connector housing		372-2624-023
P5	Connector, 18 pos		372-2625-027
P7	Connector, 18 pos		372-2625-027
P9	Connector, 18 pos		372-2624-027
P11	Connector housing		372-2624-023
1	Contact, elect (qty 128)		372-2252-010
2	Contact, elect (qty 129)		372-2601-045

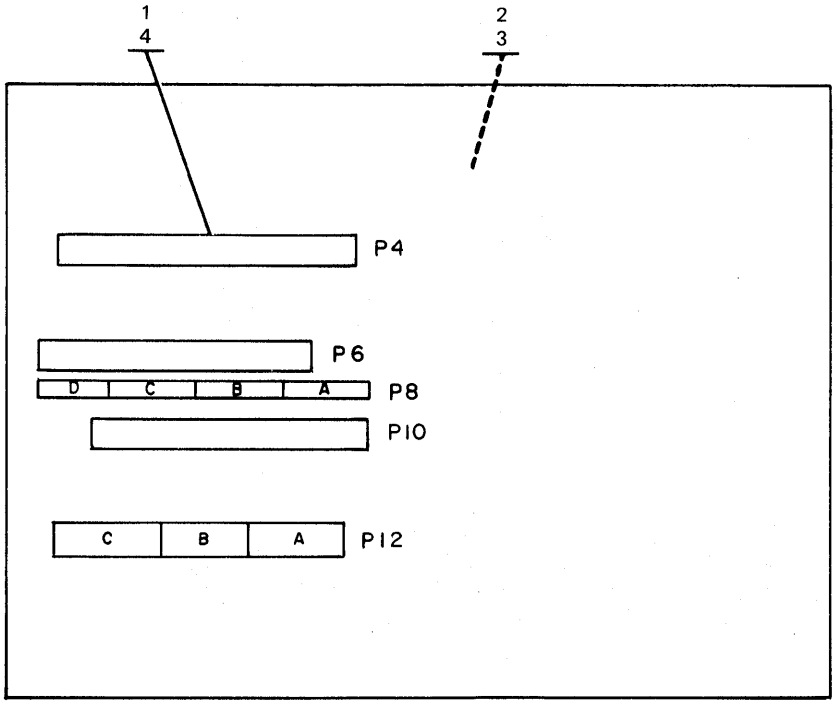


TP6-4020-019

913K-1 Back Extender Card, Component Location Diagram
Figure 3

PARTS LIST
913K-1 BACK EXTENDER CARD, CPN 618-3759-001

SYMBOL	DESCRIPTION	USED ON CODE	PART NUMBER
-	913K-1 Back extender card		618-3759-001
P4	Connector housing, 18 pos		372-2624-025
P6	Connector housing, 18 pos		372-2624-024
P8	Connector, 18 pos		372-2625-027
P10			372-2624-024
P12			372-2624-025
1	Contact, elect (qty 141)		372-2252-010
2	Contact, elect (qty 140)		372-2601-045

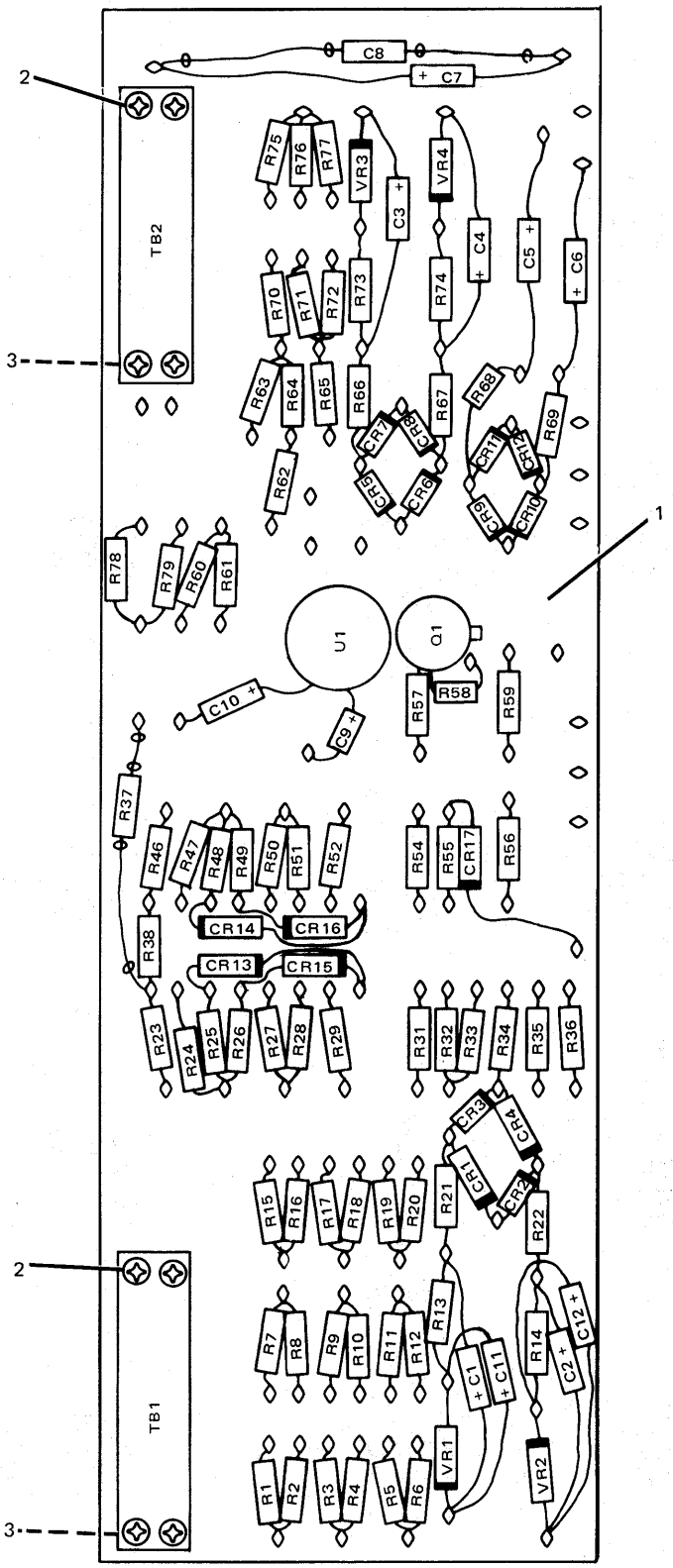


TP6-4016-019

913K-1A Back Extender Card, Component Location Diagram
Figure 4

PARTS LIST
913K-1A BACK EXTENDER CARD, CPN 601-4759-001

SYMBOL	DESCRIPTION	USED ON CODE	PART NUMBER
-	913K-1A Back extender card		601-4759-001
P4	Connector housing, 18 pos		372-2624-025
P6	Connector housing, 18 pos		372-2624-027
P8A	Connector housing, 18 pos		629-7866-001
P8B	Connector housing, 18 pos		629-7866-001
P8C	Connector housing, 18 pos		629-7866-001
P8D	Connector housing, 18 pos		629-7865-001
P10	Connector housing, 18 pos		372-2624-024
P12	Connector housing, 18 pos		372-2624-025
P12A	Connector housing, 18 pos		629-7868-001
P12B	Connector housing, 18 pos		629-7868-001
P12C	Connector housing, 18 pos		629-7867-001
1	Contact, elect (qty 98)		372-2252-010
2	Contact, elect (qty 166)		372-2601-045
3	Contact, elect (qty 5)		372-2601-049
4	Contact, elect (qty 73)		372-3392-011



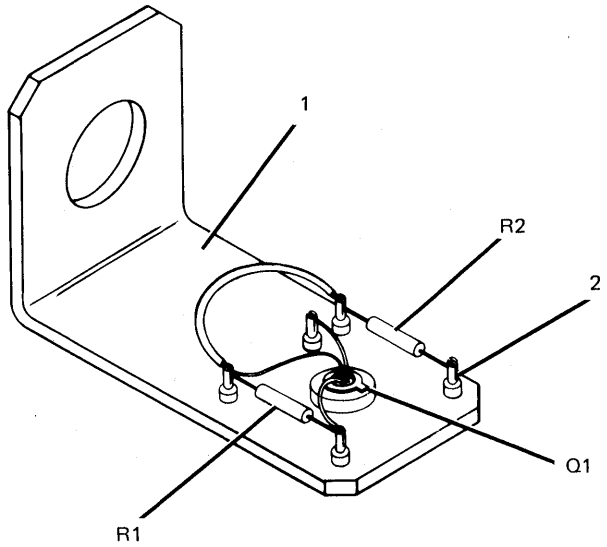
TP3-9719-019

Circuit Card Assembly A2, Component Location Diagram
Figure 5

PARTS LIST
CIRCUIT CARD ASSY A2, CPN 621-8022-001

SYMBOL	DESCRIPTION	USED ON CODE	PART NUMBER
-	Circuit card assy A2		621-8022-001
CR1	Diode, 1N645		353-2607-000
CR2	Diode, 1N645		353-2607-000
CR3	Diode, 1N645		353-2607-000
CR4	Diode, 1N645		353-2607-000
CR5	Diode, 1N645		353-2607-000
CR6	Diode, 1N645		353-2607-000
CR7	Diode, 1N645		353-2607-000
CR8	Diode, 1N645		353-2607-000
CR9	Diode, 1N645		353-2607-000
CR10	Diode, 1N645		353-2607-000
CR11	Diode, 1N645		353-2607-000
CR12	Diode, 1N645		353-2607-000
CR13	Diode, 1N645 (eff rev G, SB5)		353-2607-000
CR14	Diode, 1N645 (eff rev G, SB5)		353-2607-000
CR15	Diode, 1N645 (eff rev G, SB5)		353-2607-000
CR16	Diode, 1N645 (eff rev G, SB5)		353-2607-000
CR17	Diode, 1N645 (eff rev K, SB5)		353-2607-000
C1	Cap, al, 100μF, -10/+75%, 50V		183-1277-350
C2	Cap, al, 100μF, -10/+75%, 50V		183-1277-350
C3	Cap, al, 150μF, -10/+75%, 50V		183-1277-010
C4	Cap, al, 150μF, -10/+75%, 50V		183-1277-010
C5	Cap, al, 47μF, -10/+75%, 50V		183-1277-330
C6	Cap, al, 47μF, -10/+75%, 50V		183-1277-330
C7	Cap, al, 68μF, -10/+50%, 100V		183-1277-810
C8	Cap, ppr, 0.1μF, 20%, 200V		931-4508-000
C9	Cap, ta, 1μF, 20%, 50V		184-9087-440
C10	Cap, ta, 10μF, 20%, 50V		184-9087-620
C11	Cap, al, 220μF, 30V (eff rev F, SB5)		183-2338-000
C12	Cap, al, 220μF, 30V (eff rev F, SB5)		183-2338-000
Q1	Transistor, npn, 2N2222A		352-0661-020
R1	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R2	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R3	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R4	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R5	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R6	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R7	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R8	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R9	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R10	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R11	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R12	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R13	Res, ww, 330Ω, 5%, 3W (eff thru rev E)		747-5388-000
R13	Res, ww, 47Ω, 5%, 3W (eff rev F, SB5)		747-5379-000
R14	Res, ww, 330Ω, 5%, 3W (eff thru rev E)		747-5388-000
R14	Res, ww, 47Ω, 5%, 3W (eff rev F, SB5)		747-5379-000
R15	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R16	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R17	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R18	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R19	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R20	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R21	Res, ww, 100Ω, 5%, 3W (eff thru rev E)		747-5340-000
R21	Res, ww, 47Ω, 5%, 3W (eff rev F, SB5)		747-5379-000
R22	Res, ww, 100Ω, 5%, 3W (eff thru rev E)		747-5340-000
R22	Res, ww, 47Ω, 5%, 3W (eff rev F, SB5)		747-5379-000
R23	Res, mf, 562kΩ, 1%, 1/8W		705-1454-330
R24	Res, mf, 196Ω, 1%, 1/2W (eff thru rev E)		705-7062-000
R24	Res, mf, 511Ω, 1%, 1/4W (eff rev F, SB5)		705-6582-000
R25	Res, mf, 1.78kΩ, 1%, 1/2W (eff thru rev E)		705-7108-000
R25	Res, mf, 5.49kΩ, 1%, 1/8W (eff rev F thru G)		705-3605-350
R25	Res, cc, 1.8kΩ, 10%, 1/4W (eff rev H, SB5)		745-0758-000
R26	Res, mf, 1.78kΩ, 1%, 1/2W (eff thru rev E)		705-7108-000
R26	Res, mf, 5.49kΩ, 1%, 1/8W (eff rev F thru G)		705-3605-350
R26	Res, cc, 1.8kΩ, 10%, 1/4W (eff rev H, SB5)		745-0758-000
R27	Res, mf, 196Ω, 1%, 1/2W (eff thru rev E)		705-7062-000
R27	Res, mf, 249Ω, 1%, 1/4W (eff rev F, SB3)		705-6567-000
R28	Res, mf, 196Ω, 1%, 1/2W (eff thru rev E)		705-7062-000
R28	Res, mf, 249Ω, 1%, 1/4W (eff rev F, SB3)		705-6567-000
R29	Res, mf, 196Ω, 1%, 1/2W (eff thru rev E)		705-7062-000
R29	Res, mf, 249Ω, 1%, 1/4W (eff rev F, SB5)		705-6567-000
R30	Res, mf, 196Ω, 1%, 1/2W (eff thru rev E)		705-7062-000
R30	Not used (eff rev F, SB5)		
R31	Res, mf, 1.47kΩ, 1%, 1/4W		705-6604-000
R32	Res, mf, 1.47kΩ, 1%, 1/4W		705-6604-000
R33	Res, mf, 1.47kΩ, 1%, 1/4W		705-6604-000
R34	Res, mf, 1.47kΩ, 1%, 1/4W		705-6604-000
R35	Res, mf, 1.47kΩ, 1%, 1/4W		705-6604-000
R36	Res, mf, 1.47kΩ, 1%, 1/4W		705-6604-000
R37	Res, mf, 6.04kΩ, 1%, 1/8W		705-1468-310
R38	Res, mf, 2.94kΩ, 1%, 1/4W		705-3602-180
R39	Res, mf, 511Ω, 1%, 1/2W (eff thru rev E)		705-7082-000
R40	Res, mf, 51.5Ω, 1%, 1/8W (eff thru rev F)		705-1454-080
R40	Not used eff rev F, SB5		
R41	Res, mf, 51.5Ω, 1%, 1/8W (eff thru rev F)		705-1454-080

SYMBOL	DESCRIPTION	USED ON CODE	PART NUMBER
R41	Not used eff rev F, SB5		
R42	Res, mf, 511Ω, 1%, 1/2W (eff thru rev E)		705-7082-000
R42	Not used eff rev F, SB5		
R43	Res, mf, 511Ω, 1%, 1/2W (eff thru rev E)		705-7082-000
R43	Not used eff rev F, SB5		
R44	Res, mf, 511Ω, 1%, 1/2W (eff thru rev E)		705-7082-000
R44	Not used eff rev F, SB5		
R45	Res, mf, 511Ω, 1%, 1/2W (eff thru rev E)		705-7082-000
R45	Not used eff rev F, SB5		
R46	Res, mf, 499Ω, 1%, 1/8W		705-1469-790
R47	Res, mf, 511Ω, 1%, 1/2W (eff thru rev E)		705-7082-000
R47	Res, mf, 511Ω, 1%, 1/4W (eff rev F, SB5)		705-6582-000
R48	Res, mf, 51.1kΩ, 1%, 1/8W (eff thru rev E)		705-1454-080
R48	Res, mf, 5.49kΩ, 1%, 1/8W (eff rev F thru G)		705-3605-350
R48	Res, cc, 1.8kΩ, 10%, 1/4W (eff rev H, SB5)		745-0758-000
R49	Res, mf, 51.1kΩ, 1%, 1/8W (eff thru rev E)		705-1454-080
R49	Res, mf, 5.49kΩ, 1%, 1/8W (eff rev F thru G)		705-3605-350
R49	Res, cc, 1.8kΩ, 10%, 1/4W (eff rev H, SB5)		745-0758-000
R50	Res, mf, 511Ω, 1%, 1/2W (without SB3 or SB5)		705-7082-000
R50	Res, mf, 249Ω, 1%, 1/4W (eff rev F, SB5)		705-6567-000
R51	Res, mf, 511Ω, 1%, 1/2W (without SB3 or SB5)		705-7082-000
R51	Res, mf, 249Ω, 1%, 1/4W (eff rev F, SB5)		705-6567-000
R52	Res, mf, 511Ω, 1%, 1/2W (eff thru rev E)		705-7082-000
R52	Res, mf, 249Ω, 1%, 1/4W (eff rev F, SB5)		705-6567-000
R53	Res, mf, 511Ω, 1%, 1/2W (without SB5)		705-7082-000
R54	Res, cc, 1.8kΩ, 10%, 1/4W		745-0758-000
R55	Res, mf, 9.09kΩ, 1%, 1/4W (eff thru rev C, SB2)		705-6642-000
R55	Res, mf, 4.42kΩ, 1%, 1/4W (eff rev D thru F SB3)		705-6627-000
R55	Res, cc, 470Ω, 10%, 1/2W (eff rev G thru J)		745-1338-000
R55	Res, cc, 2.7kΩ, 10%, 1/2W (eff rev K)		745-1370-000
R56	Res, ww, 15Ω, 5%, 3W		747-5373-000
R57	Res, mf, 21.5kΩ, 1%, 1/4W		705-6660-000
R58	Res, mf, 2.15kΩ, 1%, 1/4W		705-6612-000
R59	Res, ww, 15Ω, 5%, 3W		747-5373-000
R60	Res, mf, 4.22kΩ, 1%, 1/2W		705-7126-000
R61	Res, cc, 180Ω, 10%, 1W		745-3321-000
R62	Res, mf, 4.64kΩ, 1%, 1/4W		705-6628-000
R63	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R64	Res, mf, 1kΩ, 1%, 1/4W		705-6596-000
R65	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R66	Res, ww, 100Ω, 5%, 3W		747-5340-000
R67	Res, ww, 100Ω, 5%, 3W		747-5340-000
R68	Res, ww, 15Ω, 5%, 3W		747-5373-000
R69	Res, ww, 15Ω, 5%, 3W		747-5373-000
R70	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R71	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R72	Res, mf, 10kΩ, 1%, 1/4W		705-6644-000
R73	Res, ww, 150Ω, 5%, 3W		747-5385-000
R74	Res, ww, 150Ω, 5%, 3W		747-5385-000
R75	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R76	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R77	Res, mf, 5.11kΩ, 1%, 1/4W		705-6630-000
R78	Res, mf, 1MΩ, 1%, 1/4W		705-6740-000
R79	Res, cc, 10MΩ, 10%, 1/4W		745-0893-000
TB1	Terminal block		367-0121-000
TB2	Terminal block		367-0121-000
U1	IC, op amp 741 (ESDS)		351-1029-010
VR1	Diode, zener, 15V, 1N3024		353-3129-000
VR2	Diode, zener, 15V, 1N3024		353-3129-000
VR3	Diode, zener, 13V, 1N4961		353-6522-070
VR4	Diode, zener, 13V, 1N4961		353-6522-070
1	Terminal board		621-8046-002
2	Screw, pph, 6-32 x 1/2 (qty 8)		343-0036-000
3	Terminal lug (qty 19)		304-0252-000



TP6-4017-019

Circuit Card Assembly A3, A4, and A5, Component Location Diagram
Figure 6

PARTS LIST
CIRCUIT CARD ASSY A3, A4, A5, CPN 647-4008-002

SYMBOL	DESCRIPTION	USED ON CODE	PART NUMBER
-	Circuit card assy		647-4008-002
Q1	Transistor, npn, 2N2222A		352-0661-020
R1	Res, cc, 2.2kΩ, 10%, 1/4W		745-0761-000
R2	Res, cc, 22kΩ, 10%, 1/4W		745-0797-000
1	Terminal board		647-4005-001
2	Post, terminal (qty 5)		306-2222-100

Collins 972S-2 Autopilot Bench Test Set

Rockwell International

bulletins

Collins General Aviation Division

Printed in USA

523-0774017-001118
25 July 1985

Service Bulletins and Service Information Letters Issued to Date

SB/SIL Number	*Unit*	*Title*	*Date*
1(R1)	972S-2	Product Improvement and Extend Capability	Apr 9/75
2(R1)	972S-2	Product Improvement and Extended Capability	Nov 20/75
3(R1)	972S-2	Modify to Permit Testing of 161H-1 With Service Bulletin No 6 Installed	Dec 15/75
4	972S-2	Addition of 5-V DC Lighting and External Dimmer	Feb 5/76
5	972S-2	Addition of 913K-1A Test Capability and Improve Test Set Performance	Apr 15/77
6	972S-2	Addition of Lamp Driver to Facilitate Testing 614E-41A and 329A-3/4	Sep 29/80
7	972S-2	Modification to Provide 334D-6( ) Trim and Low Voltage Testing	Mar 15/83