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# LinAire Test Panels

## LTS-525/A

### TEST SET FOR THE KING KI-525 & KI-525A HSI



## INSTALLATION

**2.10** This Test Panel measures 7" high, 19" wide and 5 3/4" deep. It is compatible with all standard relay racks and cabinets or may be used as a stand alone unit.

**2.20** Power Requirements: 115VAC 400HZ  
Terminal ID: AC HI, AC LO, Frame GND

**2.30** It is recommended that a minimum size of 18 gauge wire be used for the power and ground connections. Larger wire will, of course, be required if there is an appreciable distance between the panel and power supply source.

## OPERATING INSTRUCTIONS

### 3.10 PANEL METER SELECTOR

TO-FROM position measures current flow in microamperes.

NAV 14VDC position measures Nav Power voltage when 14VDC is selected by the NAV POWER switch.

NAV 28VDC position measures Nav Power voltage when 28VDC is selected by the NAV POWER switch.

**+15UREG position measures Unregulated +15VDC voltage.**  
**-15VDC position measures -15VDC regulated voltage.**  
**+15VDC position measures +15VDC regulated voltage.**  
**TP-A position measures DC voltage at TP-A tip jack.**  
**NAV FLAG position measures the DC voltage across the flag circuit.**  
**NAV DEV position measures current flow in microamperes.**  
**GS FLAG position measures the DC voltage across the flag circuit.**  
**GS DEV position measures DC voltage across the deviation circuit.**

**3.12 PANEL POWER / OFF switch.**

**Applies power to Panel Power Lamp and the DC power supply.**

**3.14 PANEL POWER FUSE**

**Protects the panel DC power supply. 2AMP normal blow fuse.**

**3.16 NAV POWER selector switch.**

**Use to select 14 or 28 volt operation and sets lighting voltage.**

**3.18 NAV POWER ADJUSTMENT pot.**

**Use to set Nav Power voltage level within the selected range.**

**3.20 +5VDC POWER switch.**

**Applies 5VDC to the KI-525/A**

**3.22 +/-15VDC POWER switch.**

**Applies +15 and -15 VDC to the KI-525/A.**

**3.24 UNREG 15V adjustment.**

**Adjusts Unreg 15VDC when Variable/Normal switch is positioned in the Variable position.**

**3.26 UNREG 15V VARIABLE/NORMAL switch.**

**The Normal position applies +15VDC +/-0.5V to the KI-525/A.**

**The Variable position allows the voltage to be adjusted between 0-14.5VDC +/-1.0V**

**3.28 NAV FLAG adjustment.**

**Used to set the voltage across the Nav Flag circuit.**

**3.30 NAV FLAG +CMR selector.**

**Used to test the common mode rejection of the Nav Flag circuit. Applies +10VDC to both sides of the flag.**

**3.32 METER CURRENT ADJ**

**Used to set the current for the TO-FROM flag or the DEVIATION bar movements when the DEVIATION/RESISTANCE switch is in the Deviation**

position.

### **3.34 DEVIATION/RESISTANCE switch**

With switch in Deviation position the Meter Current Adjustment pot sets the current for the TO-FROM FLAG or the DEVIATION bar movements. The Resistance position is used to test the meter movements resistance by setting the voltage at TP-A with the Resistance CAL pot.

### **3.36 DEV-BAR/TO-FROM switch**

The switch selects which movement is used with the Meter Current Adj or Resistance CAL pots.

### **3.38 TP-A tip jack**

Used to measure test voltage applied during Resistance testing.

### **3.40 RESISTANCE CAL pot**

Used to set test voltage applied during Resistance testing.

### **3.42 GS FLAG INVALID/VALID pot**

Adjustment for the voltage applied to the GS Flag circuit.

### **3.44 GS FLAG +/- CMR selector.**

Used to test the common mode rejection of the GS Flag circuit. Applies +/- 10VDC to both sides of the flag.

### **3.46 GS DEVIATION DN/UP pot**

Adjusts the voltage applied to the GS Deviation circuit.

### **3.48 GS DEVIATION +/- CMR selector**

Used to test the common mode rejection of the GS Deviation circuit. Applies +/-10VDC to both sides of the circuit.

### **3.50 SPEED DEC/INC pot**

Adjusts the stepper motor Speed.

### **3.52 CCW/CW switch**

Sets the direction of the stepper motor that moves the compass card.

### **3.54 STEPPER ON/OFF switch**

Applies power to the stepper motor circuit.

### **3.56 HEADING INVALID/VALID switch**

The Valid position provides ground to the Heading Flag.

### **3.58 LIGHTING DEC/INC pot**

Adjusts the lighting level in the HSI.

### **3.60 PANEL SUPPLY VOLTAGES tip jacks**

Used to access and monitor the panel's DC power supply.

### **3.62 J101 TEST POINTS tip jacks**

Access to all the pins used in the J101 connector.

### **3.64 J102 TEST POINTS tip jacks**

Access to all the pins used in the J102 connector.

### **3.66 P1 MAIN connector**

Connection from test harness between panel and HSI.

### **3.68 P2 OBS rear connector**

Allows for easy connection of OBS signals to rear of panel.

## **OPERATION - TESTING KI-525/A HSI**

The following test and test data sheets which come from the King Maintenance Manual (KI 525 A Pictorial Navigation Indicator - Section VI Maintenance) are provided here for your convenience.

**6.2.1 (7) Place the following tester switches to the indicated position.**

### **6.2.4 Final Test Procedure**

The unit shall be completely assembled with the cover in place.

1.) Connect the unit to the tester and set the panel switches as listed in 6.2.1 (7) above. Place the heading and course pointers under the lubber line and adjust the GS Flag, GS Deviation and Nav Flag sources for 0.0 vdc. Record the following voltages:

- a) J1 Pin P(+) to S(-) 0.0+/-0.3 vdc
- b) J1 Pin e(+) to S(-) 0.0+/-0.6 vdc

2.) Adjust the 14/28 vdc pot for +11.2 vdc on the panel meter with NAV 14VDC selected. The NAV and HDG flags shall be fully in view. Slowly increase the NAV flag voltage until the NAV flag snaps up out of view. The flag shall be completely out of view.

NAV flag voltage (J1 K(+) to F(-)) 0.21+/-0.03 vdc  
Adjust the 14/28 vdc pot for +14.0vdc.

3.) Switch the NAV flag CMR switch to the +CMR position. The NAV flag shall not

be in view.

4.) Switch the 14/28vdc NAV POWER OFF. The NAV flag shall come completely into view.

5.) Switch the 14/28vdc NAV POWER to the 28vdc position, and adjust the 14/28 vdc pot for +28.0 vdc. The NAV flag shall go completely out of view.

6.) Decrease the voltage to 22.4 vdc. The NAV flag shall remain out of view.

7.) Slowly decrease the NAV flag voltage until the NAV flag drops into view. Switch the HEADING switch to valid. The HDG flag shall be completely out of view. The NAV flag voltage shall be (J1 K(+) to F(-))  $0.17 \pm 0.03$  vdc. Return the NAV POWER voltage to +28.0 vdc.

8.) Monitor the voltage J1 P(+) to S(-) and adjust the heading pointer 10 degrees left of the lubber line. P(+) to S(-)  $-5.5 \pm 1.2$  vdc.

9.) Continue to rotate the heading pointer to the left until the voltage stops changing. The pointer shall be  $30 \pm 5$  degrees left of the lubber line. P(+) to S(-)  $-12.5 \pm 2$  vdc.

10.) Adjust the pointer 10 degrees right of the lubber line. P(+) to S(-)  $+5.5 \pm 1.2$  vdc.

11.) Continue to rotate the heading pointer to the right until the voltage stops changing. The pointer shall be  $30 \pm 5$  degrees right of the lubber line. p(+) to S(-)  $+12.5 \pm 2$  vdc.

12.) Continue to rotating the the heading pointer to the right until the voltage switches to  $-14 \pm 3$  vdc. The heading pointer shall be within 10 degrees of the bottom of the indicator.

13.) Monitor the voltage J1 e(+) to S(-) and adjust the course pointer 10 degrees left. e(+) to S(-)  $-2.1 \pm 0.4$  vdc.

14.) Continue to rotate the course pointer to the left until the voltage stops changing. The pointer shall be  $80 \pm 10$  degrees left of the lubber line. e(+) to S(-)  $-12.5 \pm 2$  vdc.

15.) Adjust the pointer 10 degrees right of the lubber line. e(+) to S(-)  $+2.1 \pm 0.4$  vdc.

16.) Continue to rotate the course pointer to the right until the voltage stops

changing. The pointer shall be  $80 \pm 10$  degrees right of the lubber line. e(+) to S(-)  $+12.5 \pm 2$  vdc.

17.) Continue rotating the course pointer to the right until the voltage begins to decrease.

CRS pointer will be at  $100 \pm 10$  degrees left of lubber line.

18.) Continue right hand rotation until the voltage reads 0.0 vdc. The course pointer shall be within 10 degrees of the bottom of the indicator.

19.) Continue right hand rotation until the voltage stops changing. CRS pointer will be at  $100 \pm 10$  degrees left of the lubber line.

20.) Adjust the GS deviation for maximum POS, maximum NEG, then back to zero. At no time shall the GS pointer come into view.

21.) Increase the GS flag voltage (J2 J(+) to J1 W(-)) to 0.215 vdc.

a) The GS pointer shall drop into view within 10 seconds.

b) GS pointer will be at center scale  $\pm 1/2$  needle width (left side)

c) GS pointer will be at center scale  $\pm 1/2$  needle width (right side)

d) The GS pointer shall have no tendency to oscillate.

22.) Switch the GS flag, CMR switch to the +CMR, -CMR, then OFF positions. At no time shall the pointer move out of view.

23.) Adjust the GS pointer to the following positions on the GS scale and record the input voltages from J2 E to B.

a) one dot up  $+75 \pm 10$ mvdc

b) Two dots up  $+150 \pm 20$ mvdc

c) Maximum up command Pointer in view at top of scale when viewed at 30 degrees above the unit center line.

d) one dot down  $-75 \pm 10$ mvdc

e) Two dots down  $-150 \pm 20$ mvdc

24.) Adjust the GS flag voltage (J2 J(+) J1 w(-)) to 0.185 vdc. The GS pointer shall slowly move up out of view.

25.) Adjust the GS DEV voltage to 0.0 vdc.

26.) Place the RESISTANCE / DEVIATION switch to RESISTANCE and the DEV-BAR / TO-FROM switch to DEV-BAR. Adjust the RESISTANCE CAL pot for 0.3 vdc at TP-A.

(J1 pin b(+)) GND pin(-)  $0.150 \pm 0.004$  vdc.

27.) Switch the DEV-BAR / TO-FROM switch to the TO-FROM position and adjust the RESISTANCE CAL pot for 0.3 vdc at TP-A. (J1 Z(+)) GND(-)  $0.050 \pm 0.005$  vdc.

28.) Switch the RESISTANCE / DEVIATION switch to DEVIATION and rotate the METER current adj for a fully in view TO indication. Position the course pointer under lubber line. (TO-FROM flag points toward course pointer) (J1 Z(+) to T(-) +200+/-40 uadc.

29.) Repeat for a full FROM indication. (J1 Z(+) to T(-) -200+/-40 uadc.

30.) Rotate the Meter current adj to 0.0. Slowly rotate the course pointer 360 degrees. The TO-FROM flag shall remain totally out of view when viewed from the front.

31.) Tilt the unit 90 degrees up. The TO-FROM flag shall remain out of view.

32.) Switch the DEV-BAR / TO-FROM switch to the DEV-BAR position and position the course pointer under the lubber line. With the Meter current adj at 0.0 vdc, the course deviation bar shall be aligned with the ends of the course select pointer and with the symbolic airplane centerline within 1/4 bar width

33.) Slowly rotate the course pointer 360 degrees. The DEV bar shall not move more than 1/2 bar width.

34.) Tilt the unit 90 degrees up. The DEV bar shall not move more than 1/2 bar width.

35.) Adjust the DEV bar to the following positions and record the currents on the panel meter with NAV DEV selected. The DEV bar shall be unrestricted throughout the travel.

- a) One dot left -30+/-4 uadc
- b) Two dots left -60+/-8 uadc
- c) Three dots left -90+/-12 uadc
- d) Four dots left -120+/-16 uadc
- e) Five dots left -150+/-20 uadc
- f) Five dots right +150+/-20 uadc
- g) Four dots right +120+/-16 uadc
- h) Three dots right +90+/-12 uadc
- i) Two dots right +60+/-8 uadc
- j) One dot right +30+/-4 uadc

36.) Switch the stepper drive ON and adjust the slew speed for a 1.0 second square wave period at J2 Pin A. The heading card shall move smoothly with uniform steps. Switch the CW/CCW switch to CW and check for smoothness.

37.) Decrease the square wave period at J2 Pin A to 67 ms and check the display for smoothness in both directions.

38.) Switch the stepper drive OFF and position the heading bug at 360 degrees and the course pointer at 90 degrees relative to the compass card. Switch the stepper drive ON and allow the card to make two revolutions. The heading bug and the course pointer shall be within two degrees of the respective starting positions. Repeat this test with the display rotating in the opposite direction.

39.) Rotate the heading knob in a direction opposite to that of the compass card. The compass card shall continue rotating smoothly without missing any steps. Repeat for the opposite direction. Allow the compass card to rotate 360 degrees in each direction.

40.) Decrease the square wave period at J2 Pin A to 33 ms and check the display for smoothness in both directions. There shall be no evidence of missed steps. Increase the square wave period to 0.1 second and shut off the display.

41.) Connect the PAI to the panel jacks and using the stepper drive direction and speed controls, position NORTH under the lubber line.

a) PAI: Slaving CT 0.0+/-1.0 degrees

b) PAI: HDG CX 0.0+/-1.0 degrees

Position the compass card to the headings shown and record the PAI values.

a) HDG: 90 Slave CT 90+/-1.0 degrees

HDG CX 90+/-1.0 degrees

b) HDG: 180 Slave CT 180+/-1.0 degrees

HDG CX 180+/-1.0 degrees

c) HDG: 270 Slave CT 270+/-1.0 degrees

HDG CX 270+/-1.0 degrees

d) HDG: 0.0 Slave CT 0.0+/-1.0 degrees

HDG CX 0.0+/-1.0 degrees

42.) The course resolver shall be zeroed at 300 degrees +/-1.0 degrees using the constant rotor voltage test in RTCA paper 209-54/DO-62.

43.) The stator output voltages determined in accordance with constant rotor voltage test shall be 0.180+/-0.012.

44.) Connect the resolver to a calibrated resolver, phase shifter, accuracy bridge or equivalent error measuring equipment, and excite the rotor with 0.5 volts 30 Hz. Rotate the course knob CW to position the course pointer at 60 degree increments from 0 through 360 degrees. The maximum error shall be +/-1 degree.

45.) Switch the +15UNREG switch to VARIABLE and rotate the adjust pot fully CCW. The HDG flag shall be fully in view.



46.) Slowly rotate the adjust pot CW until the HDG flag snaps out of view. (J1 v(+)  
+10 +3,-4 vdc.)

47.) Slowly rotate the adjust pot CCW until the HDG flag snaps into view. (J1v(+)  
+4+/-3 vdc.

48.) Place the +15 UNREG switch to NORMAL. Switch the HDG VALID switch to  
INVALID. The HDG flag shall come completely into view.

49.) Adjust the lighting pot fully CW. and observe both lamps ON and uniform  
illumination of the display. (NOTE: typographic mistake in King manual. No lamps  
ON at this point.)

50.) Switch the 14/28v switch to 14v and adj for 14vdc on the panel meter with  
NAV 14VDC selected. Both lamps shall be ON and the display shall be illuminated  
in a uniform manner.

51.) Slowly decrease the lighting intensity. The display illumination shall decrease  
in a smooth and uniform fashion.

52.) Switch 14/28v switch to 28v and adjust for 28vdc on the panel meter with NAV  
28VDC selected. Slowly increase the lighting intensity. The display illumination  
shall increase in a smooth and uniform manner

53.) Adjust the METER current pot for half scale on the DEV-BAR and slowly  
rotate compass card 360 degrees using the stepper drive controls. There shall be  
no discontinuity in the DEV-BAR display.

54.) Place the DEV-BAR / TO-FROM switch to TO-FROM and adjust the METER  
current pot until the flag is just off the stop in either the TO or FROM position.  
Slowly rotate the compass card 360 degrees. There shall be no discontinuity in  
the TO-FROM display.

55.) Rotate the METER current pot fully CW. Reduce the current to 100 uadc. The  
TO-FROM flag shall move smoothly off the stop. Repeat for the opposite polarity.

56.) Place the DEV-BAR / TO-FROM switch to DEV-BAR position and rotate the  
METER current pot fully CW. Rotate the compass card 360 degrees. The DEV-  
BAR shall not touch the compass card. Reduce the current to 90 uadc. The DEV-  
BAR shall move smoothly off the stop. Repeat for the opposite polarity.

END OF TEST